DOCUMENT RESUME

ED 105 818	IR 001 782

TITLE	Handbook of Adult Curriculum Development.
INSTITUTION	Training Research and Development Station, Prince Albert (Saskatchewan).
PUB DATE	Nov 74
NOTE	323p.; Pages 163-203 may reproduce poorly
AVAILABLE FROM	Information Canada, Publications Satellite, P. O. Box 1565, Prince Albert, Saskatchewan, Canada S6V 5T2 ($6.95)
EDRS PRICE	MF-$0.76 HC-$15.86 PLUS POSTAGE
DESCRIPTORS	*Adult Education; Behavioral Objectives; *Curriculum Development; Educational Administration; Flow Charts; Guides; *Individualized Instruction; *Instructional Design; Instructional Media; Instructional Systems; Learning Characteristics; Manpower Development; Program Evaluation; Training; Workshops

ABSTRACT

Alternative instructional designs and delivery systems for adult training are described in a collection of presentations from the National Workshop on Canada Manpower Training. Most are based on experience of the Saskatchewan NewStart program and of the Training Research and Development Station, Saskatchewan. Presentations cover in detail behavioral and training objectives, the individualized learning process, cognitive styles and their meaning for training and development, course development from the developer's and administrator's viewpoints, planning audiovisual software and the role of evaluation. (SK)

ED105818

BEST COPY AVAILABLE

ED105818

HANDBOOK OF ADULT CURRICULUM DEVELOPMENT

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

TRAINING RESEARCH AND DEVELOPMENT STATION
DEPARTMENT OF MANPOWER AND IMMIGRATION
PRINCE ALBERT, SASKATCHEWAN, CANADA

"PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL HAS BEEN GRANTED BY
V. W. Mullen, A/ Director
T.R.&D.Sta., Prince Albert
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER."

© 1974 Training Research and Development Station

All rights reserved. No part of this book may be reproduced in any form by mimeograph or any other means, without permission in writing by the Training Research and Development Station.

Printed in Canada
by
Modern Press
Saskatoon Sask.

FOREWORD

This Handbook of Adult Curriculum Development is based largely on presentations prepared for the National Workshop on the Canada Manpower Training Program held in Winnipeg during February, 1974. The processes of development and evaluation described in the different papers were selected because of their immediate practical value and were sometimes adapted to fit a particular program situation, or the processes grew out of the experience of course development and evaluation officers working at Saskatchewan NewStart Incorporated during the years 1968 to 1972 and after that at the Training Research and Development Station. Several of the chapters were published early in 1974 in a report entitled Canadian Open Adult Learning Systems. For a wider application and understanding of the development processes described in these papers, the publications associated with the different projects referred to should be consulted.

It is hoped that this study will further the discussion of alternative instructional designs and delivery systems for adult training and should not be construed as a formal proposal by the Department of Manpower and Immigration.

The Training Research and Development Station was established in September, 1972 to develop new methods of counselling and training adults.

V. W. Mullen,
Acting Director,
Training Research and
Development Station

November, 1974

TABLE OF CONTENTS

Page

CHAPTER I Characteristics and Formulation of Behavioral Objectives
A.D. Smith 1

CHAPTER II Sequencing and Clustering Behavioral Objectives
L.G. Tippett 17

CHAPTER III Generic Training Objectives for BTSD
A.D. Smith 25

CHAPTER IV The Individualized Learning Process
V.W. Mullen 87

CHAPTER V Cognitive Styles and Their Mapping for Training and Development
Bikkar S. Randhawa 97

CHAPTER VI Course Development from the Developer's Viewpoint
Naida Waite 119

CHAPTER VII Course Development from the Administrator's Viewpoint
Naida Waite 149

CHAPTER VIII Planning Audio Visual Software
Ross Ingroville 157

CHAPTER IX The Role of Evaluation in the Development of Training Programs
Philip W. Warren 199

CHAPTER I

CHARACTERISTICS & FORMULATION OF BEHAVIORAL OBJECTIVES

A. D. Smith*

To ensure that the characteristics of Behavioral Objectives and their formulation be placed in a proper context, it is essential to examine the four major approaches used by most educators when stating their goals.

APPROACHES USED FOR
DELINEATING EDUCATIONAL GOALS

1. Instructor Oriented
2. Activity Oriented
3. Learning Oriented
4. Behavior Oriented (Observable & Measurable)

Far too many educators use what may be called the "Instructor Oriented Approach". Sample objectives which they develop tend to state "The teacher will explain the causes of the First World War" or "The teacher will lead a discussion on the Riel Rebellion". In this approach, the student is essentially an observer, usually passive, and the emphasis is placed on instructor teaching rather than student learning.

Still other educators structure their curriculum in terms of a sequence of activities in which the students will participate. They use, what has been called, "The Activity Oriented Approach" and develop objectives, such as "The students will discuss the causes of the First World War" or "The students will take a trip to a factory". Educators who use this approach tend to feel that their objectives have been reached when the students have participated in all the activities with some degree of involvement. More attention is paid to the structuring of the environment for learning rather than the intended outcomes.

---

* Manager, Skill Development Studies
Training Research and Development Station

Paper read at a National Workshop on Individualized Adult Science Education in Prince Albert, Saskatchewan, May, 1972.

Another approach which may be used is the "Learning Oriented Approach". Educators who use this approach tend to write objectives, such as "The student will learn the causes of the First World War" or "The student will better understand Confederation". I sympathize with educators who use this approach because they are honestly attempting to put the emphasis on the student. However, because they do not use words such as "knowing" and "understanding" according to their precise context, their methods are often traditional and their efforts tend to the subjective rather than the objective.

The final approach, and one which should be discussed in detail, is "The Behavior Oriented Approach". In this approach, the outcome of learning is stated in terms of what the student will be able to do as a result of learning. In other words, adherents to this approach have defined learning as, "An observable change in behavior of the student as a result of the learning experience". Those,who believe in this approach, define the learning objectives first and then determine the learning experiences necessary for the student to attain these objectives.

In simple terms, a behavioral objective is a precise statement of what a student will be able to do as a result of a unit of instruction. There are many styles of formulating behavioral objectives. The styles are unimportant - what is important is that they contain four essential characteristics.

CHARACTERISTICS

1. Stated from student's point of view.
2. Stated in observable behavior.
3. Specify conditions under which behavior will be performed.
4. Specify acceptable level of performance.

First. Behavioral objectives are expressed in terms of the student rather than that of the teacher. It must be emphasized that behavioral objectives are not the teacher's goals - or guides - or aims. They are a statement of what the student is to achieve.

Second. Behavioral objectives are always expressed in observable behavior. If you cannot see the behavior performed on the part of the student, it is not a behavioral objective.

Third. They contain a statement or statements of the conditions under which the behavior will be performed.

Fourth. A behavioral objective should always clearly indicate the required standard of performance.

Let's take a closer look at each of the four characteristics.

1. STATED FROM STUDENT'S POINT OF VIEW

.. ~~The teacher will~~
.. ~~Encourage your students to~~
.. ~~Stimulate the students~~

.. THE STUDENT WILL BE ABLE TO

Regardless of the style in which a behavioral objective is written, it should always be from the point of view of the student. Teachers who have been writing instructional aims for years find this particularly difficult. They have been writing teacher objectives rather than student objectives and many of them require considerable help in developing the skill of writing objectives in terms of the student.

Another difficulty in writing objectives from a student point of view is the difficulty of being precise while still remaining in students' terms.

~~The student will be able to calculate the difference between any two three digit numbers.~~

SOLVE PROBLEMS LIKE THESE:

$$\begin{array}{rr} 578 & 402 \\ -399 & -127 \\ \hline \end{array}$$

The first objective is obviously precise but a student who cannot subtract is not likely to understand it. It is not written from his point of view. He would be more likely to understand the second objective.

2. STATED IN OBSERVABLE BEHAVIOR

A. PERFORMANCE TO BE OBSERVED:

Given a partner and the appropriate music, he will perform the basic fox trot dance steps.

B. RESULTS OF PERFORMANCE TO BE OBSERVED:

Solve simple quadratic equations.

What is meant by observable behavior? It can mean one of two things or a combination of both. If you were teaching a student to dance you would probably want to observe the actual skill being performed. For academic work, in many cases, you would observe the results of the behavior performance.

In vocational training, you would probably wish to observe the behavior and examine the results frequently.

BEHAVIORAL WORDS

~~understand~~
~~learn~~
~~study~~
~~know~~
~~appreciate~~

state
list
repair
construct
solve

explain
identify
sketch
build
recognize

Because we have no way of observing a student's brain while performing, we do not use words like "understand" or "know". Instead, we use action words which demonstrate a student's understanding or knowledge. Even many of the words on this list require modification to show the actual behavior. For example, you can identify by circling, underlining, touching, etc.

3. CONDITIONS OF BEHAVIOR

Without References
From Memory
Given Tools
Provided With
Drawings Of
With No Warning
From a Stock Pile

The third characteristic of behavioral objectives is that they specify the conditions under which the behavior will be performed. Neither the instructor nor the student should have any illusions about the conditions under which the behavior is to be performed. For example, it would be unfair for the student to be told that the materials are to be provided and then expect him to select the most appropriate materials from a stockpile.

Likewise, a student has a right to know whether he has to perform from memory or whether he will be allowed the use of his reference material.

4. ACCEPTABLE LEVEL OF PERFORMANCE

.. tolerance from -1/8" to +1/8"
.. 90% accuracy
.. at least 10
.. no more than 2 errors
.. without error

~~.. satisfactory~~
~~.. good~~
~~.. acceptable~~

At some stage, teachers have to become precise about the required standard of performance. All too often this is done by marking the examination papers. This is one significant difference in the use of behavioral objectives. The student is not judged in relation to his peers - instead he is judged in relation to a well defined standard. Marks or grades may be given to the student for administrative purposes. However, most educators believe it is only necessary to substantiate whether or not the student can perform the objective. The belief that students relish the competition for high marks or grades is held only by instructors and the better students who are trying for top place. The others generally just wish to pass the course as best as they can. If you set the level of performance where it is acceptable, then that in itself becomes the objective rather than some meaningless percentage or grade.

Let's have a look at a behavioral objective and identify the last three characteristics.

(Given a sketch of four levers**)

the student will be able to

(classify*)
(at least 3 of them***)

by inserting the letters A, B
or C under each diagram

* Student Behavior
** Conditions of Behavior
*** Standards of Behavior

As you see, the student behavior is indicated by an asterisk (*). He will demonstrate his attainment of the objective by inserting - the letter A, B or C. The condition of behavior is indicated by **. He is provided with a sketch.

The standard of performance is shown with three asterisks (***). He must have at least three of them correct to achieve this objective.

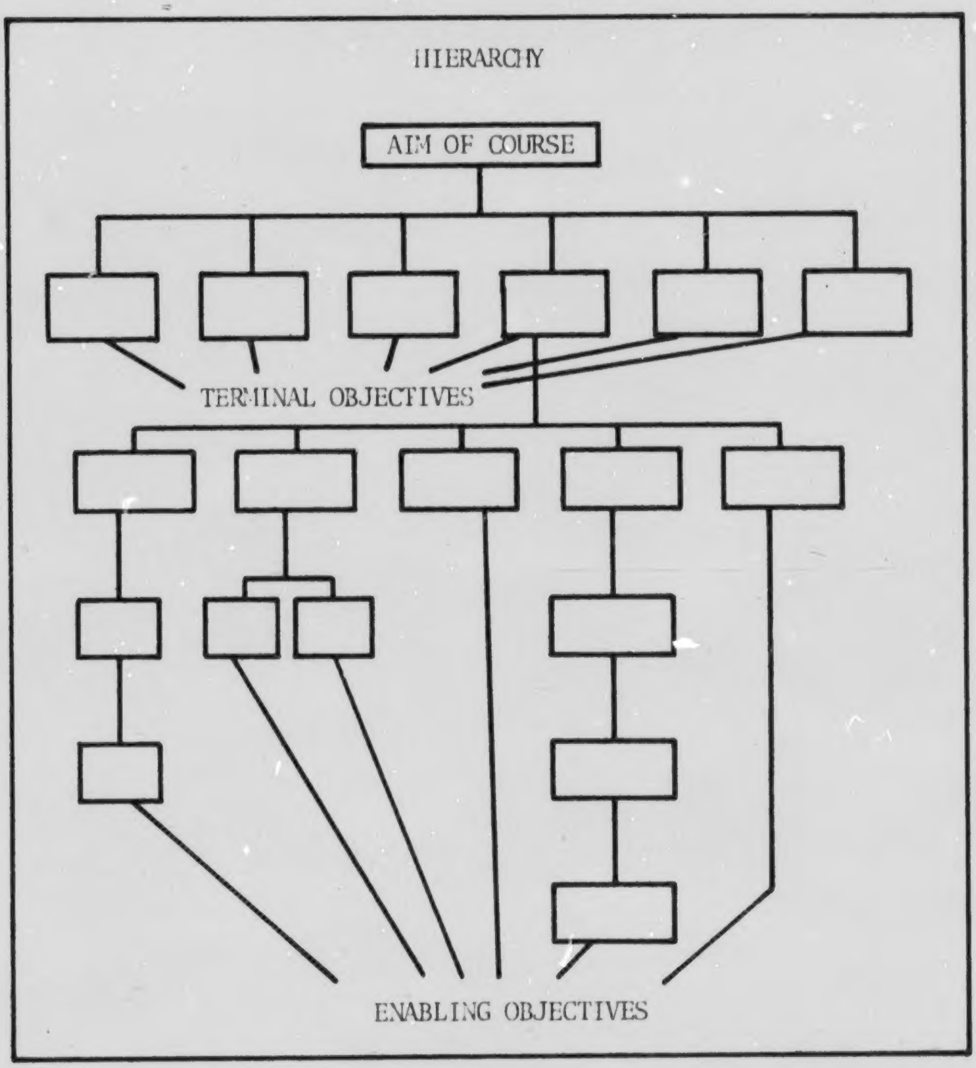
Hopefully, my objectives regarding the characteristics of behavioral objectives have been accomplished. In the following section, the formulation of behavioral objectives will be discussed.

There are many styles of writing behavioral objectives. Some people insist that they must begin with the words, "The student will be able to". Others believe that this is unnecessary verbiage and they insist that they begin with an imperative or action verb such as "state", "list", "construct", etc. Some developers believe that all behavioral objectives should commence with the word "given". Still others break them down into three distinct parts of conditions, actions, and standards. The style is really unimportant; what is important is that the teacher and the students clearly understand the intent of the objective.

An objective is not necessarily good because it has been written in behavioral terms. A teacher or instructor who has developed poor or inappropriate test items will probably develop poor objectives. I would like to comment on a few of the typical errors which many make when they begin to develop behavioral objectives.

Probably the most common type of error is in the use of numerous low level cognitive skills. Pure memory objectives such as list, define, state the four principles of, etc., are easy to write. This is understandable because research in the United States regarding actual examinations has frequently shown a content of 80 to 90 percent of pure knowledge questions.

Another frequent type of error is the creation of objectives which are so general or global that they are nearly unteachable. Such objectives as, "the student must be able to communicate", or "must be able to perform mathematics", fall into this category. Objectives of this type need further analysis so that they may be broken down into the specific skills which are required to accomplish the general objective. A detailed analysis of a course or an occupation will usually reveal a hierarchy of objectives.



The projectual on the previous page shows a typical hierarchy which has three levels. The first level shows the aim of the course which is probably not written in behavioral terms, but which is in fact, a short description of the course. At the next level you would identify terminal or global objectives. For an electrician this might be the ability to install a 100-amp service entrance.

At a lower level, multi enabling behavioral objectives can be identified. These are generally discrete and quite specific skills. For the electrician, these could include skills such as measuring and cutting electric cable, making terminal connections, or identifying material. The point I wish to make clear is the fact that it is all too easy to identify the terminal objectives and then find that they are so broad or general that they really are not teachable.

A third type of error involves the formulation of all objectives so specifically that they are in fact the test item. Objectives such as "The student will be able to list the four characteristics of a behavioral objective" are quite specific. It should be noted that this is not a bad objective. However, if all the objectives for a course are that specific, then there is room for argument that behavioral objectives do not really cover the range and depth required of a particular course.

There are some administrative short cuts which will lessen the difficulties of developing behavioral objectives. The statement, "The student will be able to" can be assumed to be part of each objective. Similarily, one can say that unless otherwise stated, the student will always have his reference books or will always be provided with the tools of his trade, etc.

In conclusion, the following slides will show the value of behavioral objectives in terms of the student, the teacher, and the curriculum developers.

Left Projector	Right Projector
Slide 1 ? WHY ?	Slide 1a BEHAVIORAL OBJECTIVES
Slide 2 1. THEY HELP STUDENTS	Slide 2a
Slide 3 1. THEY HELP STUDENTS	Slide 3a ..KNOW PRECISELY WHAT THEY HAVE TO DO

Slide 4

1. THEY HELP STUDENTS

Slide 4a

..Know precisely what they have to do
..STUDY MORE EFFECTIVELY

Slide 5

1. THEY HELP STUDENTS

Slide 5a

..Know precisely what they have to do
..Study more effectively
..COMPREHEND MORE EFFECTIVELY

Slide 6

1. THEY HELP STUDENTS

Slide 6a

..Know precisely what they have to do
..Study more effectively
..Comprehend more effectively
..TRY OWN SOLUTIONS

Slide 7

1. THEY HELP STUDENTS

Slide 7a

- ..Know precisely what they have to do
- ..Study more effectively
- ..Comprehend more effectively
- ..Try own solutions
- ..KNOW WHEN THEY KNOW

Slide 8

1. THEY HELP TEACHERS

Slide 8a

Slide 9

2. THEY HELP TEACHERS

Slide 9a

- ..KNOW PRECISELY WHAT IS TO BE TAUGHT

Slide 10

2. THEY HELP TEACHERS

Slide 10a

..Know precisely what is to be taught
..ASSIST IN DETERMINING METHODS

Slide 11

2. THEY HELP TEACHERS

Slide 11a

..Know precisely what is to be taught
..Assist in determining methods
..HELP IN ASSESSMENT OF STUDENT PROGRESS

Slide 12

2. THEY HELP TEACHERS

Slide 12a

..Know precisely what is to be taught
..Assist in determining methods
..Help in assessment of student progress
..AID IN SELF EVALUATION OF TEACHING TECHNIQUES

Slide 13

2. THEY HELP TEACHERS

Slide 13a

..Know precisely what is to be taught
..Assist in determining methods
..Help in assessment of student progress
..Aid in self evaluation of teaching techniques
..IF YOU DON'T KNOW WHERE YOU ARE GOING YOU ARE LIABLE TO END UP SOMEPLACE ELSE

Slide 14

3. THEY HELP DEVELOPERS

Slide 14a

Slide 15

3. THEY HELP DEVELOPERS

Slide 15a

..TO BE PRECISE IN CURRICULUM DESIGN

✓

2

Slide 16

3. THEY HELP DEVELOPERS

Slide 16a

..To be precise in curriculum design

..TO ENSURE THAT TOTAL COGNITIVE PROCESS IS BEING CONSIDERED IN INSTRUCTIONAL PROGRAM

Slide 17

3. THEY HELP DEVELOPERS

Slide 17a

..To be precise in curriculum design

..To ensure that total cognitive process is being considered in instructional program

..TO EVALUATE THE EFFECTIVENESS OF THEIR CURRICULUM DESIGN

Slide 18

Slide 18a

Slide 19

FAULTS

Slide 19a

REALITY

Slide 20

FAULTS
..DIFFICULT TO WRITE

Slide 20a

REALITY
..SO ARE TESTS AND EXAMS

Slide 21

FAULTS
..Difficult to write
..TURN OFF TEACHER

Slide 21a

REALITY
..So are tests and exams
..BUT TURN ON STUDENTS

Slide 22

FAULTS

..Difficult to write
..Turn off teacher
..OFTEN LOW LEVEL
.   COGNITIVE SKILLS

Slide 22a

REALITY

..So are tests and exams
..But turn on students
..SO ARE MANY EXAMS - BUT
   OBJECTIVES COVERING
   MORE COMPLEX COGNITIVE
   PROCESSES SUCH AS
   ANALYSIS AND SYNTHESIS
   CAN BE DEVELOPED

Slide 23

FAULTS

..Difficult to write
..Turn off teacher
..Often low level
   cognitive skills
..DON'T REALLY INCLUDE
   THE TOTAL MESSAGE
   (CREATIVITY, ADAPTABILITY, WHOLE CITIZEN,
   RESPONSIBLE, ABILITY
   TO THINK, ETC.) So
   IMPORTANT TO A COMPLETE
   WELL ROUNDED EDUCATION

Slide 23a

REALITY

..So are tests and exams
..But turn on students
..So are many exams - but
   objectives covering
   more complex cognitive
   processes such as
   analysis and synthesis
   can be developed
..PERHAPS - BUT HOW DO WE
   EVALUATE STUDENT SUCCESS UNLESS HE IS ABLE
   TO DO SOMETHING TO
   DEMONSTRATE THAT HE
   (APPRECIATES, UNDERSTANDS, BLOSSOMS OUT)
   AS A RESULT OF THIS
   MAGICAL, MYSTICAL,
   COVERT SOMETHING

CHAPTER II

SEQUENCING AND CLUSTERING BEHAVIOURAL OBJECTIVES

L. G. Tippett*

Recent developments in adult basic education (BTSD) and vocational training have placed many local training institutions such as technical institutes and others in the position of having to develop new programs to meet the needs of changing populations and training objectives.

This change in needs in adult basic education has been brought about (1) because of the advent of Canada Manpower Training Programs (BTSD) and (2) because traditional approaches to deliver adult basic education based on the school system model have failed rather miserably. There is need for a new content in programs, particularly based on early experiences, a new process of learning geared to the particular characteristics and of the learner who is peculiar to these programs.

This change, and the growing demand to deliver adult basic education in increasing amounts has caused many adult training personnel in Canada to be given the assignment: "Design a new curriculum".

Initially, this is received with excitement and enthusiasm. Almost universally however, after the excitement has tempered with reality, the question asked is, "Where do we start?"

One quickly realizes that the job of designing a curriculum involves a process and content. The process being how you design the curriculum and the content being what curriculum and related materials you plan to eventually produce. This then will be a discussion of the process of designing a curriculum. This process, as experience has shown, can be applied to designing a curriculum in any aspect of education and training. An important realization however, is that any model, or process will work if properly planned and applied. The Training Research and Development Station and others have chosen the DACUM Model.

---

* Head, Career Development Programs
Training Research and Development Station

The other aspect, as mentioned, of curriculum design is what to produce - leading to a need to define the term "curriculum" itself. Without discussing some conventional usages, the Training Research and Development Station defines the curriculum as "What the student experiences". This definition is chosen to ensure that the curriculum model provides an integration of design features which all logically point to the student who is taking the courses. This implies that the instructor is an integral part of the design and in fact is the link between the course objectives and the student. The instructor designs part of the curriculum - the most important part - the learning activities.

The curriculum design model (process), therefore, must be one which provides for a high degree of congruity between what is planned to happen and what does happen.

Several other factors in choosing a model are:

1. it should be simple.
2. it should be staged (or phased) so that clearly defined jobs can be determined and planned.
3. it should be easy to communicate to the design group and course users outside the design group.
4. it should be adaptable to the use of behaviorally stated objectives and have a built-in sequencing and clustering capability.
5. it should provide easy "fall out" of student progress evaluation, course evaluation, in-service training of instructors, certification levels and other aspects.
6. it should provide administrators with the capability of planning for the design resources which will be required in amount and kind, including personnel.
7. it must have the capability to produce a curriculum which will be an effective and efficient vehicle to change the behavior of the target group.

The DACUM Model[1]

DACUM simply stands for Designing a Curriculum. This model was developed in 1969 in a project operated under the auspices of the Social and Human Analysis Branch, Department of Regional Economic Expansion and coordinated by Howard L. Clement, a consultant with the branch at the time.

---

[1] DACUM - Designing a Curriculum, 1969, Department of Regional Economic Expansion, Ottawa.

The model has been widely used in the development of vocational training classes since its publication. Its principles can be applied equally well to basic education curriculum.

The model consists of six phases. A list[2] of these is:

Phase 1	Defining Terminal Behaviors
Phase 2	Selecting Evaluation Techniques
Phase 3	Defining Instructional Unit Objectives
Phase 4	Designing Instructional Unit Evaluation
Phase 5	Preparing Learning Activities
Phase 6	Preparing Individual Student Activities

A clarification of these six phases will outline the process of designing a curriculum based on the model.

PHASE I: DEFINING TERMINAL BEHAVIORS

Generally speaking, the terminal behaviors should present to the student a profile of the behavior he is expected to display at the end of the training period. These are behaviorally stated, somewhat "global" objectives. An example in mathematics might be:

> "The student will be able to read, write, perform the four primary operations and solve routine word problems using whole numbers."

Obviously, this is a very general statement of behavior which neither defines a scope and sequence of learning objectives, nor identifies the condition of knowledge and skill required.

It would be difficult to justify the design of a training program at this point, however, without a broader rationale in which to embed the terminal behavior profile. Therefore, to carry out Phase I completely, one must back up to the initial concept of a training program.

The curriculum designers would be faced with these decisions:

WHY - a training need has been determined by labour market or other demand.

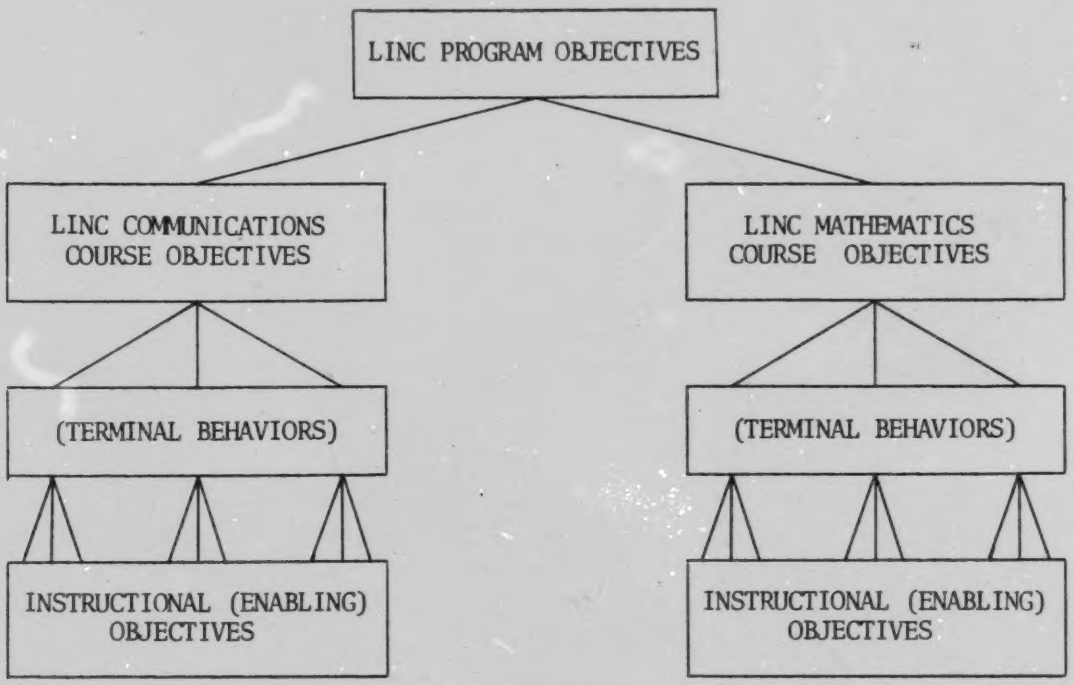
WHO - is to be trained. Considerable data should be collected on the target population so that suitable starting points, instructural strategies and other parameters can be realistically determined.

---

[2] Slightly adapted from the original.

WHAT - is to be taught. "What" should be a statement of the kind of behavior required at the end of the training. It may be as wide as "To qualify for a level II certificate" or be more narrowly defined as "A communication, mathematics and science program which will provide requisite knowledge and skill to take advantage (of a particular follow-up program such as trade training)."

At this point, a hierarchy of objectives should be known such as is defined for the Training Research and Development Station LINC Program (Learning Individualized for Canadians).[1]

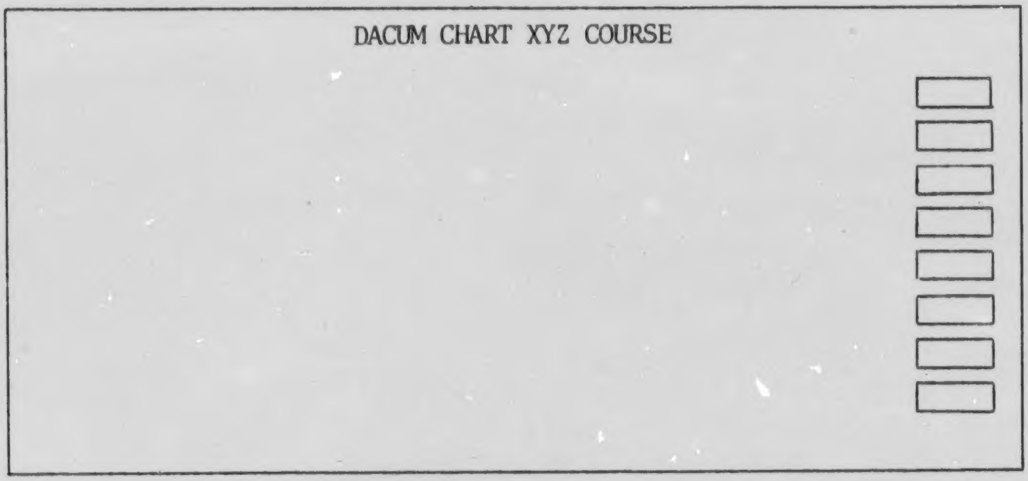

LINC PROGRAM OBJECTIVES
LINC COMMUNICATIONS COURSE OBJECTIVES
LINC MATHEMATICS COURSE OBJECTIVES
(TERMINAL BEHAVIORS)
(TERMINAL BEHAVIORS)
INSTRUCTIONAL (ENABLING) OBJECTIVES
INSTRUCTIONAL (ENABLING) OBJECTIVES

Phase I then involves the decisions related to determining and writing the program objectives, course objectives and the terminal behaviors. At this point, the DACUM charting technique can be initiated. In this technique, the terminal behaviors are arranged in the order (if sequence is necessary) that a student would progress through the course.

The Phase I chart, therefore, would look something like the following, each block representing a terminal behavior and in most cases, defining a unit of instruction. The actual objective (terminal behavior) may be written in the box or perhaps simply a title of the unit such as "Whole Numbers".

---

[1] Published by Information Canada, Prince Albert, Saskatchewan.



DACUM CHART XYZ COURSE

HOW-TO TRAIN - is a determination of the instructional strategy. In many cases, the "how" will be in part determined by the external constraints of budget, class size, plant facilities, etc.

WHEN-TO TRAIN - is a determination of program scheduling based on demands of the labour market and needs of the target population. The designer should plan for a continuous intake of students.

WHERE-TO TRAIN - is a determination of the geographical area best suited to the labour market and the target population.

Phase I, in summary, then is a complete planning phase for the new training program. Most importantly, a fairly well defined profile of the end of training behaviors is determined at this point. Note that the determination of program objectives, course objectives and terminal behaviors has not been elaborated here. This is extremely difficult in many cases and requires considerable organizational effort to organize advisory committees, design, distribute, collect and analyze the results of questionnaires. Also, machinery must be established to determine the behavioral profile desired at the end of the course. Without this effort, you may have a good course but it may not be at all relevant as to what is required.

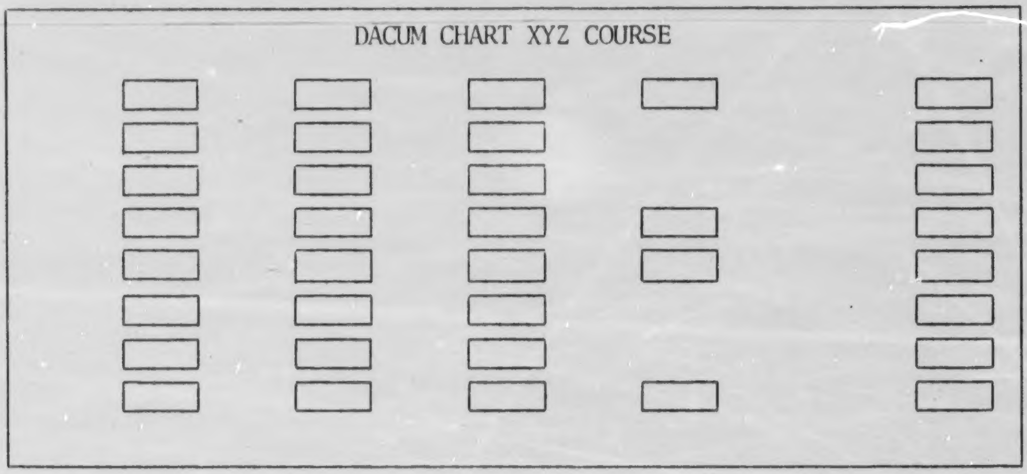
PHASE II: SELECTING EVALUATION TECHNIQUES

Terminal behaviors, being general, and extremely difficult to evaluate objectively, do not lend themselves to the design of actual testing instruments at this stage. The evaluation techniques, however, must be determined at this point.

Phase II is the point where we determine how to measure achievement of the earlier defined behavior profile. In basic education, we usually opt for a paper and pencil type evaluation system. At this stage in the LINC Program for example, a decision was made to use written tests for each unit in two forms, and a diagnostic-placement test to be prepared for each unit. It was further decided to prepare tests in two forms for each sub-unit and to set performance criteria in all Form I tests at 100% accuracy. Also the name designation and form numbering system was decided upon for the total evaluation system. Student Progress charting and progress accounting systems should also be determined at this stage.

PHASE III: DEFINING INSTRUCTIONAL UNIT OBJECTIVES

As seen in the hierarchy of objectives outlined in Phase I, these are the enabling objectives which, if achieved, will produce the terminal behaviors. These are the instructional objectives - the immediate, well defined, properly sequenced and clustered objectives - on which we base learning activities. These objectives should be written, as characteristics of good behavioral objectives, in student terms. In the LINC Program, these instruction units are called Items and clusters of instructional objectives are grouped into these items. The items are then sequenced to provide enabling experiences which lead to the achievement of the terminal behavior as described in Phase I. The sequenced and clustered objectives could be charted like this:

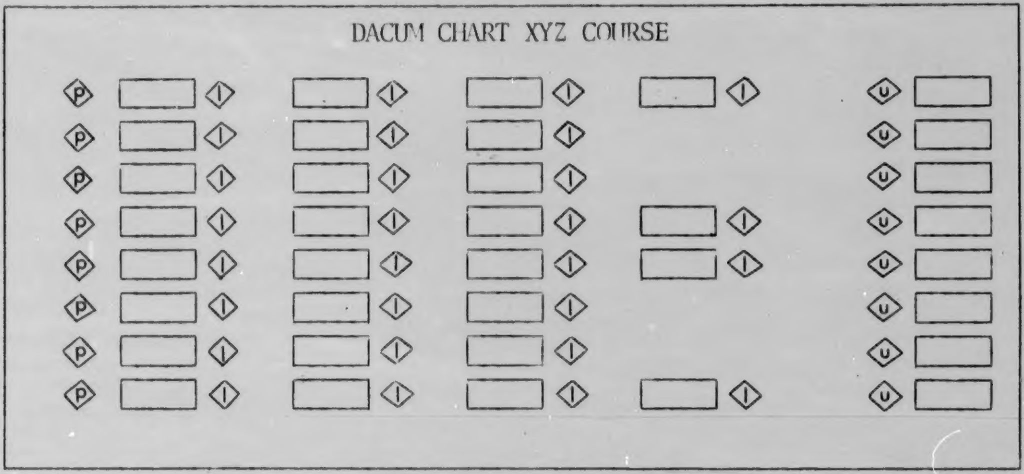


PHASE IV: DESIGNING INSTRUCTIONAL UNIT EVALUATION

At the end of Phase III all objectives have been clearly defined and our evaluation techniques have been determined. Phase IV then involves the actual design of measuring instruments. In Phase IV of the development of

LINC all Unit Progress Checks, Item Progress Checks and Placement Inventories were prepared. Each objective is checked with one or more test items, valid with respect to the objectives and is hopefully, a reliable measurement of the behavior desired. The use of behavioral objectives, of course, improves validity of test items because "what you want to measure" is clearly stated. Validity and reliability tests can be done after sufficiently large numbers of students have used the test instruments.

The DACUM chart at the end of Phase IV might look like this. The diamonds represent evaluation points of the type: P diagnostic and placement test for a unit; I , an evaluation of mastery of a group of instructional objectives (an item) and U , a longer term more comprehensive test covering several groups of instructional objectives and measuring achievement of a terminal behavior.



In summary, at the end of Phase IV, we know what objectives are to be met and we have techniques and instruments to measure achievement of these objectives. The "what to teach" decisions are all behind us at this point. Our efforts can now be focused on the instructional phases. Instruction requires resources. The next phase in the process is preparing these.

PHASE V: PREPARING LEARNING ACTIVITIES

One quickly realizes that preparing instructional material, particularly in multi-media is extremely difficult, time consuming, and costly. Most curriculum designers, therefore, search the commercial market for suitable materials, evaluate them and select those which meet the needs of the particular course. The instructional objectives from Phase IV provide a good base of content on which to base their decisions. Only after one has evaluated and selected as much commercial material as possible should the preparation of materials begin. At this point, all possible gaps have been filled and local design of materials can be focused at points where commercial materials either do not exist or are not satisfactory.

In summary then, this phase involves:

1. Evaluating existing or available material.
2. Selecting materials.
3. Designing and producing materials. (Described in Chapter VI.)

PHASE VI: PREPARING INDIVIDUAL STUDENT ACTIVITIES

This is the instructional phase. The instructor matches the student's particular needs with the objective and the previously prepared learning activities. These learning activities should be based on previous knowledge of the student's strengths and weaknesses. Using this model, all circumstances are removed except the learning process itself. The student is able through the DACUM chart and the instructional objectives to be fully aware of where he is going and the type of performance expected. The instructor can then perform as a "manager of learning" in directing the learning activities and selecting sound learning experiences with a high degree of learner involvement. A prescribed learning experience in this phase would involve a statement of:

1. the objective behavior.
2. the learning resources.
3. the learning activity.
4. an evaluation check on the effect of the activity with respect to the objective desired.

This model has proven to be an effective instrument in curriculum design for many. A model, however, can become a master instead of a tool. If it becomes a master, one is likely to stray from the main objectives of designing a learning system which is to achieve some type of behavior change in the student. Curriculum designers, therefore, must use such tools pragmatically and wisely. This model, or any model, is simply a method of planning and controlling a curriculum project. It is not the end product. Effective and efficient training of people is.

CHAPTER III

GENERIC TRAINING OBJECTIVES FOR BTSD

A. D. Smith*

INTRODUCTION

Generic skills are those overt and covert behaviors which are fundamental to the performance of many tasks and sub tasks carried out in a wide range of occupations. They are basic to both specialized applications and job specific skills.

Generic skills include many of the concepts and skills generally referred to as academic skills such as mathematics or communications. They also include the reasoning skills which are required to solve problems, make decisions, and handle certain areas of discretion. In relation to the areas already mentioned, generic skills also involve interpersonal skills, which are required when working with other people, and manipulation skills which allow one to perform on or with animate and inanimate objects while using and co-ordinating the body senses and muscles.

Examples of generic skills in each of the four areas mentioned above could include:

1. Academic skills - multiplying whole numbers and reading to determine job requirements.
2. Reasoning skills - scheduling work and diagnosing work problems.
3. Interpersonal skills - giving and receiving rewards and discipline.
4. Manipulation skills - hand/eye co-ordination and the use of proper body posture for lifting and carrying.

Excluded from generic skills are knowledge and procedural items

---

*Manager, Skill Development Studies
Training Research and Development Station

An extract from a report Generic Skills published in 1973 by the Training Research and Development Station.

which are job or employer specific and which may be attained as part of the orientation to a new job.

The aim of this chapter is to specify the purpose and content for generic skills training packages for use in Basic Training for Skill Development. These will be discussed under the following headings:

I. Purpose of Training Packages.

II. Content and Organization of Training Packages.

The following components are to be prepared as a result of the development work outlined in this chapter:

1. A discrete curriculum package for each unit. These packages are to include:
   a. the instructional objectives
   b. diagnostic and placement tests
   c. references by objectives to appropriate learning materials which have been selected or developed, and
   d. achievement tests.

2. An instructor's manual which includes information on the background, objectives, components, individualized process and procedures needed to implement and operate the program.

3. An answer book for all diagnostic, placement and achievement tests.

4. Individualized learning packages for those items where suitable or where sufficient learning materials are not available in published materials.

I. PURPOSE OF TRAINING PACKAGES

The training packages are to be designed to facilitate achievement of the following objectives:

1. To assist students to achieve the specific generic data skills which are required for chosen occupations.

2. To allow students to gain recognition for skills attained outside the educational system.

3. To provide remedial academic upgrading for those who have the official prerequisites but have forgotten the actual skills or knowledge.

4. To enable continuous intake and exit of students.
5. To provide a process by which adults may identify and acquire additional generic data skills required to advance their careers.

It is foreseen that the training packages will be implemented by occupational training institutions in a variety of situations, such as:

1. Using the program to prepare students for occupational training courses or for job entry.
2. Using the content of the program as a vocational guide to help students establish appropriate occupational goals.
3. Integrating the program with occupational training courses by allowing training time daily for the development of the generic data skills.
4. Unifying this program with occupational training courses by treating the data concepts and the occupational skill requirements as a unit.

It is also foreseen that the training packages will be used by employers:

1. In conjunction with CMTP Training on the Job (TOJ) programs.
2. In conjunction with company on job training (OJT) programs.
3. To facilitate career programs by employers.
4. To permit recognition of data skills learned by experience on the job.

II. CONTENT OF TRAINING PACKAGES

The content to be covered by the training packages is shown in the following:

1. The scope and content are shown in the skill content chart attached as Table 1.
2. A sample form of an occupational profile is included as Table 2.

TABLE 1: CONTENT CHART

UNIT	ITEM A	ITEM B	ITEM C	ITEM D	ITEM E	ITEM F
1. WHOLE NUMBERS	Read, Write & Count	Add and Subtract	Multiply	Divide	Word Problems	Round Off
2. FRACTIONS	Read & Write	Add and Subtract	Multiply	Divide	Word Problems	
3. DECIMALS	Read & Write	Add and Subtract	Multiply & Divide	Word Problems	Round Off	
4. PERCENT	Read & Write	Calculate	Ratio	Proportion	Word Problems	
5. MIXED OPERATIONS	Equivalents	Order of Operations	Occupation Word Problems	Quick Calculations		
6. ESTIMATE MEASURES	Time	Weight	Distance	Area	Liquid Volume	Spatial Volume
7. MEASURE	Scales	Time	Weight	Distance	Quantity	Verniers
8. METRIC MEASURE	Weight	Distance	Quantity	Weight Conversion	Distance Conversion	Quantity Conversion
9. DIMENSIONS	Forms & Figures	Draw/Sketch	Read Scale Drawings	Measure Scale Drawings	Draw to Scale	
10. DIMENSIONS	Perimeter	Area	Volume	Read Graphs	Construct Graphs	
11. ALGEBRA	One Variable	Two Variables	Quadratics	Variations		
12. TRIG	Logs	Slide Rule	Calculation			
13. LISTEN	Literal Comprehension	Interpretive Comprehension	Evaluative Comprehension			
14. TALK	Directions/ Instructions	Information	Questions	Formal Talks		
15. READ	Literal Comprehension	Interpretive & Evaluative	Comparative Evaluation #1	Books	Comparative Evaluation #2	Comparative Evaluation #3
16. BUSINESS READ	Notes, Letters & Memos	Forms	Charts	Manuals		
17. WRITE	Phrases	Sentences	Paragraphs	Forms	Memos	Letters
18. WRITE REPORTS	Information Reports	Recommendation Reports	Sort	Classify	Technical Reports	
19. EXCHANGE IDEAS	Debate	Peer Debate	Supervisor Debate	Conferences		
20. DIAGNOSE	List Causes	Look Up Causes	Set Priorities	Look Up Methods	Probing Questions	Use Senses
21. LATITUDE	Simple Instructions	Complex Instructions	Compound Instructions	Set Priorities		

TABLE 2: SAMPLE OCCUPATIONAL PROFILE

OCCUPATION: PAINTER CCDO NO. 8785-110

UNIT	ITEM A	ITEM B	ITEM C	ITEM D	ITEM E	ITEM F
1. WHOLE NUMBERS	Read, Write & Count ✓	Add and Subtract ✓	Multiply ✓	Divide ✓	Word Problems ✓	Round Off ✓
2. FRACTIONS	Read & Write ✓	Add and Subtract ✓	Multiply ✓	Divide ✓	Word Problems ✓	
3. DECIMALS	Read & Write ✓	Add and Subtract ✓	Multiply & Divide ✓	Word Problems ✓	Round Off ✓	
4. PERCENT	Read & Write ✓	Calculate ✓	Ratio ✓	Proportion ✓	Word Problems ✓	
5. MIXED OPERATIONS	Equivalents o	Order of Operations ✓	Occupation Word Problems ✓	Quick Calculations ✓		
6. ESTIMATE MEASURES	Time ✓	Weight ✓	Distance ✓	Area ✓	Liquid Volume ✓	Spatial Volume
7. MEASURE	Scales ✓	Time ✓	Weight o	Distance ✓	Quantity ✓	Verniers
8. METRIC MEASURE	Weight	Distance	Quantity	Weight Conversion	Distance Conversion	Quantity Conversion
9. DIMENSIONS	Forms & Figures ✓	Draw/Sketch ✓	Read Scale Drawings ✓	Measure Scale Drawings ✓	Draw to Scale	
10. DIMENSIONS	Perimeter ✓	Area ✓	Volume ✓	Read Graphs	Construct Graphs	
11. ALGEBRA	One Variable	Two Variables	Quadratics	Variations		
12. TRIG	Logs	Slide Rule	Calculation			
13. LISTEN	Literal Comprehension ✓	Interpretive Comprehension ✓	Evaluative Comprehension ✓			
14. TALK	Directions/ Instructions ✓	Information ✓	Questions ✓	Formal Talks		
15. READ	Literal Comprehension ✓	Interpretive & Evaluative ✓	Comparative Evaluation #1 ✓	Books ✓	Comparative Evaluation #2 ✓	Comparative Evaluation #3 ✓
16. BUSINESS READ	Notes, Letters & Memos ✓	Forms ✓	Charts ✓	Manuals ✓		
17. WRITE	Phrases ✓	Sentences ✓	Paragraphs ✓	Forms ✓	Memos ✓	Letters ✓
18. WRITE REPORTS	Information Reports ✓	Recommendation Reports ✓	Sort ✓	Classify ✓	Technical Reports	
19. EXCHANGE IDEAS	Debate ✓	Peer Debate ✓	Supervisor Debate ✓	Conferences ✓		
20. DIAGNOSE	List Causes ✓	Look Up Causes ✓	Set Priorities ✓	Look Up Methods ✓	Probing Questions ✓	Use Senses ✓
21. LATITUDE	Simple Instructions ✓	Complex Instructions ✓	Compound Instructions ✓	Set Priorities ✓		

codes: ✓ required
o optional

3. A matrix of occupations and skills is attached as Annex A.

4. The instructional objectives for the items included are at Annex B.

It is important to realize that the content has not been arranged in a learning hierarchy. In essence, the preceding work has been an identification of data skills which are common to many occupations and a further level of identifying their actual use by the occupations which were analyzed. The evidence contained in this report must be carefully studied before making any assumptions about sequenced skill development. Many of the items will have to be designed as discrete skills to ensure that students do not have to attain extraneous skills based on a traditional sequence of learning.

The instructional packages are to be developed for a target population who are at least functionally literate. Adults who can achieve a measured Grade IV in the reading component of standard tests such as the Canadian Test of Basic Skills should be able to achieve the required skills included in the instructional packages.

The objectives at Annex B to this report do not necessarily include the enabling skills required by adults who are unable to achieve these behaviors. It will be recalled that judgement was exercised in the design of the data collection instrument, in the belief that a number of enabling or subordinate skills could be identified on the basis of the functional skills carried out by the workers. Data was not collected on skills such as spelling requirements, diction, use of prefixes and suffixes - nor was data collected on knowledge items such as mathematics nomenclatures, (numerator, denominator, subtrahand, etc.), purpose of nouns, verbs, adverbs and prepositions. The developers will therefore necessarily have to identify and build into the curriculum two types of enabling objectives:

1. Subordinate skills which can reasonably be considered to be subsumed by the objectives at Annex B. For example, the skill of writing letters necessarily implies some ability to spell words.

2. Prerequisite skills which students necessarily have to attain before they would be able to learn the instructional objectives at Annex B. For example, students who are learning elementary arithmetic skills will probably have to learn the meanings of certain symbols and words.

Caution must be exercised in the selection and in the use of these additional curriculum objectives. Because these are to be inserted on the basis of judgment rather than on empirical evidence, the development staff should restrict their use to those which are an obvious requirement and be extremely careful when using them for diagnostic or achievement tests. We have, for example, evidence that most of the occupations surveyed have to be able to multiply and divide fractions but we have no evidence to suggest that they have to be able to correctly identify the words numerator and denominator, even though the use of these skills may help develop the skills of handling fractions.

From the preceding paragraphs it will be seen that the development staff will necessarily have to prepare or develop the following:

1. Enabling objectives designed to help those who cannot perform the instructional objectives.

2. Subordinate objectives which can be subsumed from the instructional objectives.

3. Test items to be used for diagnostic, prescription and achievement purposes.

4. A master sequential learning model to ensure that students, who need to achieve any or all of the required skills, learn them in an appropriate order or sequence.

To fulfill the specified objectives, the developed program should embrace the following types of individualization:

1. Individualized Content. The skills to be attained by each student to be based on his occupational goal, with institution and/or student options, as suggested in the appropriate occupational profiles.

2. Individualized Process. Continuous intake and exit of students to be easily administered. Students to be given necessary diagnostic and prescription tests to determine skill development needs and be allowed when reasonable and possible, a wide selection of learning materials in various media.

3. Individualized Pacing. Students to be allowed to develop skills at a pace consistent with their learning abilities. Achievement tests to be capable of individual or small group administration based on the appropriate time to meet student rather than administrative needs.

Many of the exercises and tests should involve operant as well as respondent behavior. For example, it is more important that a worker be able to state and support a conclusion reached from oral or written material than be able to identify a correct conclusion. Certainly, factually correct responses are required at the literal comprehension level but operant behavior becomes important at the interpretive and evaluative levels of comprehension.

As previously mentioned, the content has not been ordered or sequenced - nor have the mathematics and communications units been separately classified by these titles. This will allow the developers to integrate the learning experiences so the students can learn and apply mathematics and communications concepts rather than having them separated according to subjects.

The processes used in LINC (Learning Individualized for Canadians), will be used for the development of these training packages.

ANNEX A

OCCUPATIONAL SKILLS MATRIX

ANNEX A

MATRIX

OCCUPATIONAL SKILLS

		Steno, Clerk Typist, Receptionist				Secretaries			Accounting Clerks		
		- Prince Albert	- Regina	- Rural	- Combined	- Prince Albert	- Regina	- Combined	- Prince Albert	- Regina	- Combined
1 WHOLE NUMBERS	A - Read, Write & Count	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Multiply	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	D - Divide	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	E - Word Problems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F - Round Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2 FRACTIONS	A - Read & Write	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Multiply	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	D - Divide	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	E - Word Problems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3 DECIMALS	A - Read & Write	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Multiply & Divide	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	D - Word Problems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	E - Round Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

		Motor Vehicle Mechanics			Radio & TV Servicemen			Nurses Aides		
		- Prince Albert	- Regina	- Combined	- P. A. & Rural	- Saskatoon	- Combined	- P. A. & Rural	- Regina	- Combined
1 WHOLE NUMBERS	A - Read, Write & Count	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Multiply	✓	✓	✓	✓	✓	✓	✓	✓	✓
	D - Divide	✓	✓	✓	✓	✓	✓	✓	✓	✓
	E - Word Problems	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F - Round Off	✓	✓	✓	✓	✓	✓	✓		○
2 FRACTIONS	A - Read & Write	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓		○
	C - Multiply	✓	✓	✓	✓	✓	✓	✓		○
	D - Divide	✓	✓	✓	✓	✓	✓	✓		○
	E - Word Problems	✓	✓	✓	✓	✓	✓	✓		○
3 DECIMALS	A - Read & Write	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓	○	○
	C - Multiply & Divide	✓	✓	✓	✓	✓	✓	✓		○
	D - Word Problems	✓	✓	✓	✓	✓	✓	✓		○
	E - Round Off	✓	✓	✓	✓	✓	✓	✓		○

		Plumbers	Electricians	Painters	Carpenters	Welders	Construction Labourers	Meat Cutters	Commercial Cooks	Drivers, single axle	Heavy Equipment Operators	Tractor Trailer Operators
		- Regina	- Regina	- Saskatoon	- Prince Albert	- Saskatoon	- Saskatoon	- Prince Albert	- Prince Albert	- Saskatoon	- Saskatoon	- Saskatoon
1 WHOLE NUMBERS	A - Read, Write & Count	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Multiply	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	D - Divide	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	E - Word Problems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F - Round Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2 FRACTIONS	A - Read & Write	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
	C - Multiply	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
	D - Divide	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
	E - Word Problems	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
3 DECIMALS	A - Read & Write	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	○	✓	✓	✓	✓	✓
	C - Multiply & Divide	✓	✓	✓	✓	✓		✓	✓		✓	✓
	D - Word Problems	✓	✓	✓	✓	✓		✓	✓		✓	✓
	E - Round Off	✓	✓	✓	✓	✓		✓	✓		✓	✓

		Construction Equipment Mechanics	Barbers	Cosmetologists	Survey Aides	Draftsmen	Retail Sales Clerks	Waiters	Storemen	Maintenance Man Building	Medical Lab. Technician
		- Saskatoon	- Saskatoon	- Saskatoon	- Regina	- Regina	- Saskatoon	- Prince Albert	- Prince Albert	- Saskatoon	- P. A. & Rural
1 WHOLE NUMBERS	A - Read, Write & Count	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Multiply	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	D - Divide	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	E - Word Problems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F - Round Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2 FRACTIONS	A - Read & Write	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Multiply	✓	✓		✓	✓	✓	✓	✓	✓	✓
	D - Divide	✓	✓		✓	✓	✓	✓	✓	✓	✓
	E - Word Problems	✓	✓		✓	✓	✓	✓	✓	✓	✓
3 DECIMALS	A - Read & Write	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Add and Subtract	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Multiply & Divide	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	D - Word Problems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	E - Round Off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

BEST COPY AVAILABLE

4 PERCENT	A - Read & Write	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Calculate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		○	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Ratio	○		✓	○				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		○	✓	✓	✓	✓	✓	✓	✓	✓		✓	○	✓	✓	✓	✓	✓	✓	✓		✓	✓
	D - Proportion	○		✓	○				✓		○	✓	✓	✓	✓	✓	✓	○		○	✓	✓	✓	✓	✓	○	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓		✓	✓
	E - Word Problems	○		✓	○				✓		○	✓	✓	✓	✓	✓	✓	○		○	✓	✓	✓	○	✓		✓	✓				✓	✓	✓	✓	✓	✓	✓		✓	✓
5 MIXED OPERATIONS	A - Equivalents	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	○		○	✓	✓	○	✓	✓		✓	✓		○	○	✓	✓		✓	✓	✓	✓	✓	✓	✓
	B - Order of Operations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	○	○	✓	✓	✓	○		○	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	○	✓	✓	✓
	C - Occupation Word Problems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	○	○	✓	✓	✓	○		○	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	○	✓	✓	✓
	D - Quick Calculations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		○	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6 ESTIMATE MEASURES	A - Time .	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	○	✓	✓	✓	✓
	B - Weight	✓	✓		○	✓	✓	✓	✓	✓	✓	✓		○		○	○	✓	✓	✓		✓	✓	✓	✓	○	✓	✓	○	✓	✓	✓		○	✓	✓	○		✓	✓	
	C - Distance	✓			○	✓		○	✓		○	✓	✓	✓	✓	✓	✓		✓	○	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	○	✓	✓	✓		✓	✓	
	D - Area	✓			○	✓		○	○		○	✓		○	✓	✓	✓				✓	✓	✓	✓	✓					✓	✓	✓	✓		✓	✓	✓		○	✓	
	E - Liquid Volume					✓		○	○		○	✓	✓	✓		✓	○				✓	✓	✓		✓	○	○	✓		✓	✓	✓	✓	✓			✓		○	✓	✓
	F - Spatial Volume																							✓						✓					✓	✓			○		
7 MEASURE	A - Scales	✓	✓	✓	✓	○	✓	○	✓	○	○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Time	✓	✓	✓	✓		✓	○		✓	○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	○	✓			✓	✓	✓
	C - Weight	✓	✓	✓	✓		✓	○		○	○	✓		○	✓		○	✓	✓	✓		○	○	✓	✓		✓	✓		✓	✓	✓		○	✓	○	✓		✓	✓	✓
	D - Distance	✓		○	○							✓		○	✓	✓	✓	✓		○	✓	✓	✓	✓	✓	✓	○		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
	E - Quantity			✓	○							✓	✓	✓	✓	✓	✓	✓		○	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	F - Verniers											✓	✓	✓	✓	✓	✓					✓			✓							✓			✓	✓				✓	✓
8 METRIC MEASURE	A - Weight											✓	○	○																				○							✓
	B - Distance											✓	✓	✓	○	○	○				✓				○							✓			○				✓		✓
	C - Quantity											✓	✓	✓																				○							✓
	D - Weight Conversion											✓		○																											✓
	E - Distance Conversion											✓		○																					○						✓
	F - Quantity Conversion											✓	✓	✓																											✓
9 DIMENSIONS	A - Forms & Figures	✓	✓		○		✓	○		✓	○	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	
	B - Draw/Sketch	✓			○							✓	○	○	✓	✓	✓				✓	✓	✓	✓	✓			○	○	✓	✓	✓	✓	✓	✓	✓				✓	
	C - Read Scale Drawings	✓			○							✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓				✓	✓	✓	✓	○		✓	✓	○			✓	
	D - Measure Scale Drawings	○			○							✓		○	✓	✓	✓				✓	✓	✓	✓	✓							✓			✓	✓	○			✓	
	E - Draw to Scale														✓	✓	✓				✓	✓		✓											✓	✓	○				
10 DIMENSIONS	A - Perimeter			○	○					✓	○	✓		○	✓		○				✓	✓	✓	✓	✓					✓	✓	✓	✓		✓	✓	✓			✓	○
	B - Area	○	○	✓	○					✓	○	✓	○	○	✓		○				✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		✓	✓	✓			✓	○
	C - Volume			○	○					✓	○	✓	✓	✓		○	○				✓	✓	✓	✓	✓			○		✓	✓	✓	✓		✓	✓	✓			✓	○

MATRIX

OCCUPATIONAL SKILLS

Occupation	Location	D - Read Graphs	E - Construct Graphs	11 ALGEBRA A - One Variable	B - Two Variable	C - Quadratics	D - Variations	12 TRIG A - Logs	B - Slide Rule	C - Calculation	13 LISTEN A - Literal Comprehension	B - Interpretive Comprehension	C - Evaluative Comprehension	14 TALK A - Directions/Instructions	B - Information	C - Questions	D - Formal Talks
Steno, Clerk Typist, Receptionist	- Prince Albert	✓	✓								✓	✓	✓	✓	✓	✓	
	- Regina										✓	✓	✓	✓	✓	✓	
	- Rural										✓	✓	✓	✓	✓	✓	
	- Combined	○	○								✓	✓	✓	✓	✓	✓	
Secretaries	- Prince Albert										✓	✓	✓	✓	✓	✓	
	- Regina										✓	✓	✓	✓	✓	✓	
	- Combined										✓	✓	✓	✓	✓	✓	
Accounting Clerks	- Prince Albert										✓	✓	✓	✓	✓	✓	
	- Regina										✓	✓	✓	✓	✓	✓	
	- Combined										✓	✓	✓	✓	✓	✓	
Motor Vehicle Mechanics	- Prince Albert	✓									✓	✓	✓	✓	✓	✓	
	- Regina										✓	✓	✓	✓	✓	✓	
	- Combined	○									✓	✓	✓	✓	✓	✓	
Radio & TV Servicemen	- P. A. & Rural	✓		✓	✓	✓	✓	✓	○	✓	✓	✓	✓	✓	✓	✓	
	- Saskatoon	✓	○	○							✓	✓	✓	✓	✓	✓	○
	- Combined	✓	○	○	○	○	○	○	○	○	✓	✓	✓	✓	✓	✓	○
Nurses Aides	- P. A. & Rural										✓	✓	✓	✓	✓	✓	
	- Regina										✓	✓	✓	✓	✓	✓	
	- Combined										✓	✓	✓	✓	✓	✓	
Plumbers	- Regina										✓	✓	✓	✓	✓	✓	
Electricians	- Regina			✓							✓	✓	✓	✓	✓	✓	
Painters	- Saskatoon										✓	✓	✓	✓	✓	✓	
Carpenters	- Prince Albert										✓	✓	✓	✓	✓	✓	
Welders	- Saskatoon										✓	✓	✓	✓	✓	✓	○
Construction Labourers	- Saskatoon										✓	✓	✓	✓	✓	✓	
Meat Cutters	- Prince Albert										✓	✓	✓	✓	✓	✓	
Commercial Cooks	- Prince Albert	○									✓	✓	✓	✓	✓	✓	
Drivers, single axle	- Saskatoon										✓			✓	✓	✓	
Heavy Equipment Operators	- Saskatoon										✓	✓	✓	✓	✓	✓	
Tractor Trailer Operators	- Saskatoon	✓	○								✓	✓	✓	✓	✓	✓	
Construction Equipment Mechanics	- Saskatoon										✓	✓	✓	✓	✓	✓	
Barbers	- Saskatoon	○									✓	✓	✓	✓	✓	✓	✓
Cosmetologists	- Saskatoon										✓	✓	✓	✓	✓	✓	✓
Survey Aides	- Regina	✓		✓	✓	✓	✓	✓	○	✓	✓	✓	✓	✓	✓	✓	
Draftsmen	- Regina	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Retail Sales Clerk	- Saskatoon										✓	✓	✓	✓	✓	✓	
Waiters	- Prince Albert										✓	✓	✓	✓	✓	✓	
Storemen	- Prince Albert										✓	✓	✓	✓	✓	✓	
Maintenance Man Building	- Saskatoon			○							✓	✓	✓	✓	✓	✓	✓
Medical Lab. Technician	- P. A. & Rural	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	

15 READ	A - Literal Comprehension	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Interpretive & Evaluative	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Comparative Evaluation #1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	○	○	○	✓	✓	✓	✓	✓		✓	✓	○	✓	✓	✓	✓	✓	✓	✓	✓	○	✓	✓	✓
	D - Books	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	E - Comparative Evaluation #2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	○	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
	F - Comparative Evaluation #3		✓	✓	○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓				✓
16 BUSINESS READ	A - Notes, letters & memos	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Forms	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Charts	✓	✓		○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	○		✓	✓
	D - Manuals	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
17 WRITE	A - Phrases	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Sentences	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Paragraphs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
	D - Forms	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
	E - Memos	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
	F - Letters	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
18 WRITE REPORTS	A - Information Reports	✓	✓		○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	○	✓			○	○	✓	✓	✓	✓	○	✓		✓		✓	✓	✓
	B - Recommendation Reports											✓	○	○	✓	✓	✓				✓	✓	✓		✓					✓	✓	✓	✓							✓	
	C - Sort	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	○	✓	✓	✓	✓	✓	✓	✓	✓	○		✓	✓	✓	✓	✓	✓	✓	○	✓	✓	✓
	D - Classify	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	○	○	✓	✓	✓				✓	✓	✓		✓		✓		✓				✓	✓	✓	✓	✓		✓	✓	✓
	E - Tech. Reps.									○	○	○		○		○	○					○																			
19 EXCHANGE IDEAS	A - Debate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Peer Debate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Supervisor Debate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	D - Conferences					✓		○				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
20 DIAGNOSE	A - List Causes	✓	✓		○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	○	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			✓			✓	✓
	B - Look Up Causes		✓		○	✓		○	✓		○	✓	✓	✓	✓	✓	✓				✓	✓	✓		✓		✓			✓	○	✓	✓	✓			○			✓	✓
	C - Set Priorities	✓	✓		○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	○	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓			○			✓	
	D - Look Up Methods					✓		○	✓		○	✓	✓	✓	✓	✓	✓				✓	✓	✓		✓		✓			✓	✓	✓	✓	✓						✓	✓
	E - Probing Questions	✓	✓		○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	○	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓			✓			✓	✓
	F - Use Senses	✓			○	✓	○	○	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	○	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			✓			✓	✓
21 LATITUDE	A - Simple Instrs.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	B - Complex Instrs.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	C - Compound Instrs.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	D - Set Priorities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	○	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓

ANNEX B
INSTRUCTIONAL OBJECTIVES

TABLE OF CONTENTS

	UNIT	UNIT TITLE	PAGE
Mathematics	1	Whole Numbers	40
	2	Fractions	43
	3	Decimals	46
	4	Percent	48
	5	Mixed Operations	50
	6	Estimate Measures	52
	7	Scales (Measure)	55
	8	Metric Measurement	57
	9	Dimensions	60
	10	Dimensions	62
	11	Algebra	64
	12	Trigonometry	65
Communications	13	Listen	66
	14	Talk	67
	15	Read	69
	16	Business Read	71
	17	Write	73
	18	Write Reports	76
	19	Exchange Ideas	78
	20	Diagnose	81
	21	Latitude	84

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 1 - WHOLE NUMBERS

ITEM A - UNIT 1

READ, WRITE, AND COUNT (WHOLE NUMBERS)

OBJECTIVES

1. Count a set of up to 100 objects and state or write the number of objects counted.
2. Identify place value of digits in a given whole number with up to 7 digits.
3. Read a given whole number less than 10 million and write its name in words.
4. Write a whole number less than 10 million given the word name of the number.
5. Write numbers to one million after counting or reading the word name of the number.
6. Arrange a set of whole numbers in ascending or descending order.

ITEM B - UNIT 1

ADD AND SUBTRACT (WHOLE NUMBERS)

OBJECTIVES

1. Perform additions of whole numbers given instructions such as:

   What is the total of 8 and 5?
   Find the sum of 8 and 5.
   Add 8 and 5.
   8 plus 5 is ___.
   8 + 5 = ___.
   $\begin{array}{r} 8 \\ \underline{+5} \end{array}$

2. Find the sum of a set of whole numbers of 1-5 digits including cases where carrying is required.

ANNEX B

INSTRUCTIONAL OBJECTIVES

3. Perform subtraction of whole numbers given instructions such as:

    8 minus 5 is ___.
    Subtract 5 from 8.
    Find the difference of 8 and 5.
    If you had 8 and gave away 5, you would have ___.
    8 - 5 = ___.
    $\begin{array}{r} 8 \\ \underline{-5} \end{array}$

4. Find the difference of two 1-5 digit numbers including cases where borrowing is required.

5. Solve a routine word problem using subtraction or addition of whole numbers.

ITEM C - UNIT 1

MULTIPLY (WHOLE NUMBERS)

OBJECTIVES

1. Perform multiplication of whole numbers given instructions such as:

    6 times 2 is ___.
    Three two's are ___.
    The product of 6 and 2 is ___.
    6 x 2 = ___.
    $\begin{array}{r} 6 \\ \underline{\times 2} \end{array}$

2. Find the product of a given pair of whole numbers of which one number is up to 5 digits and the other number up to three digits.

3. Solve a routine word problem using multiplication or division of whole numbers.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM D - UNIT 1

DIVIDE (WHOLE NUMBERS)

OBJECTIVES

1. Perform division of two simple whole numbers (no remainder) given instructions such as:

   2 divided by 6 is ___.
   2 into 6 goes ___ times.
   The quotient of 6 divided by 2 is ___.
   6 ÷ 2 = ___.
   2)6 = ___.
   $\frac{6}{2}$ = ___.

2. Find quotients of 1-5 digit dividends and 1-3 divisors including cases where there are remainders.

3. Solve routine word problems using division of whole numbers.

ITEM E - UNIT 1

WORD PROBLEMS (WHOLE NUMBERS)

OBJECTIVE

1. Use addition, subtraction, multiplication or division, as appropriate, in the solution of routine occupational word problems with whole numbers.

ITEM F - UNIT 1

ROUND OFF (WHOLE NUMBERS)

OBJECTIVE

1. Round off a number to nearest ten, hundred, thousand, ten thousand, or hundred thousand.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 2 - FRACTIONS

NB: Fractions used for test items are to be those which could realistically be expected to be used in occupational work (e.g., one to two digit denominators OR even hundreds, thousands). Fractions used in occupational operations generally have denominators such as 2,3,4,5,10,25,100,1000, 2000 and not 7,9,37,1005, etc. Comparison or reduction of fractions usually involves no more than three fractions and the denominators usually have a measurement relationship such as x/4, x/8, x/16, or x/9 and x/27.

ITEM A - UNIT 2

READ AND WRITE (FRACTIONS)

OBJECTIVES

1. Identify a common fraction as being a number of parts of a total number of equal parts.
2. Reduce a fraction to its simplest form (lowest terms).
3. Change improper fractions to mixed numbers and mixed numbers to improper fractions.
4. Write equivalent fractions for a given fraction given a new numerator and denominator.
5. Arrange a set of fractions and/or mixed numbers in ascending or descending order.
6. Write what fractional part one number is of another in simplest form.

ITEM B - UNIT 2

ADD AND SUBTRACT (FRACTIONS)

OBJECTIVES

1. Calculate the sum in simplest form of two or three common fractions with like denominators.

ANNEX B

INSTRUCTIONAL OBJECTIVES

2. Calculate the sum in simplest form of two or three common fractions with unlike denominators.

3. Calculate the sum in simplest form of two or three mixed numbers with like and unlike denominators.

4. Calculate the sum in simplest form of two or three numbers which include at least one proper fraction and one mixed number.

5. Calculate the difference in simplest form of two common fractions with like denominators.

6. Calculate the difference in simplest form of two common fractions with unlike denominators.

7. Calculate the difference in simplest form of two mixed numbers which have like denominators including cases where borrowing is required.

8. Calculate the difference in simplest form of two mixed numbers which have unlike denominators including cases where borrowing is required.

9. Solve a routine word problem using addition and/or subtraction of fractional numbers.

ITEM C - UNIT 2

MULTIPLY (FRACTIONS)

OBJECTIVES

1. Calculate the product in simplest form of:
    a. a common fraction and a whole number
    b. two common fractions.

2. Calculate the product.in simplest form:
    a. a mixed number and a whole number
    b. two mixed numbers.

3. Calculate the product in simplest form of two or three numbers which include at least one common fraction and one mixed number.

ANNEX B

INSTRUCTIONAL OBJECTIVES

4. Solve a routine word problem using multiplication of fractional numbers.

ITEM D - UNIT 2

DIVIDE (FRACTIONS)

OBJECTIVES

1. Calculate the quotient in simplest form of:
   a. a common fraction divided by a whole number
   b. two common fractions
   c. a whole number divided by a common fraction.

2. Calculate the quotient in simplest form of:
   a. a mixed number and a whole number
   b. a mixed number and a common number
   c. two mixed numbers.

3. Solve a routine word problem using division of fractional numbers.

ITEM E - UNIT 2

WORD PROBLEMS (FRACTIONS)

OBJECTIVES

1. Solve a routine word problem using addition, subtraction, multiplication and/or division of fractions.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 3 - DECIMALS

NB: Decimals used for test items are to be those which could realistically be expected to be used in occupational work (e.g., no more than three zeros required to position the decimal (.0001) or no more than three digits after the decimal is rounded off (1.782).

ITEM A - UNIT 3

READ AND WRITE (DECIMALS)

OBJECTIVES

1. Read a given 1-4 place decimal fraction and write its name in words.
2. Write a 1-4 place decimal fraction given the word name of the number.
3. Arrange a set of decimal fractions in ascending or descending order.
4. Write:
    a. the total value of a given combination of dollars, quarters, dimes, nickels, and cents.
    b. the combination of dollars and coins equivalent to a given money value.

ITEM B - UNIT 3

ADD AND SUBTRACT (DECIMALS)

OBJECTIVES

1. Calculate the sum of a set of decimal fractions.
2. Calculate the difference of two decimal fractions.
3. Solve a routine word problem using addition and/or subtraction of decimal fractions.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM C - UNIT 3

MULTIPLY AND DIVIDE (DECIMALS)

OBJECTIVES

1. Calculate the product of two decimal fractions when rounding off is (a) not required (b) required.

2. Calculate to a given number of decimal places, the quotient of a whole number divided into:
    a. a whole number larger than the divisor.
    b. a whole number smaller than the divisor.
    c. a decimal fraction.

3. Calculate to a given number of decimal places, the quotient of a decimal fraction divided into:
    a. a decimal fraction.
    b. a whole number.

4. Solve a routine word problem using multiplication and/or division of decimals.

ITEM D - UNIT 3

WORD PROBLEMS (DECIMALS)

OBJECTIVE

1. Solve a routine word problem using addition, subtraction, multiplication, and/or division of decimal fractions and common fractions or mixed numbers.

ITEM E - UNIT 3

ROUND OFF (DECIMALS)

OBJECTIVES

1. Round off a decimal fraction to the nearest tenth, hundredth, thousandth, or ten-thousandth.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 4 - PERCENT

ITEM A - UNIT 4

READ AND WRITE (PERCENT)

OBJECTIVES

1. Identify a percent as equivalent to a fraction with 100 as the denominator.
2. Identify the % symbol by writing in words a given percentage.

ITEM B - UNIT 4

CALCULATE (PERCENT)

OBJECTIVES

1. Calculate a percent of a number. (Type 1: a% of b = ___.)
2. Solve a routine word problem involving calculation of a percent of a number.
3. Calculate the percent one number is of another. (Type 2: a is ___% of b).
4. Solve a routine word problem involving calculation of the percent one number is of another.
5. Calculate a number when a percent of it is known. (Type 3: a% of ___ = b).
6. Solve a routine word problem involving calculation of a number when a percent of it is known.
7. Solve percentage word problems involving money, people, objects, time, and other data.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM C - UNIT 4

RATIO (PERCENT)

OBJECTIVES

1. Identify comparisons of two numbers in the forms a:b, $\frac{a}{b}$, "a is to b", or "a parts to b parts", etc., as ratios.
2. State or write in simplest form (lowest terms) a ratio of two numbers in the form:
   a. a:b
   b. $\frac{a}{b}$
3. Write a ratio given a description of the two numbers one of which must be determined by adding or subtracting the numbers in a given ratio.

ITEM D - UNIT 4

PROPORTION (PERCENT)

OBJECTIVES

1. Identify an equality of two numbers in the form: a:b - c:d, $\frac{a}{b} = \frac{c}{d}$, "a is to b as c is to d", or "a parts to b parts is the same as c parts to d parts", etc., as a proportion.
2. Calculate the unknown number given 3 numbers in a proportion.
3. Calculate a number when a fraction of it is known, using the proportion method.
4. Solve a routine word problem which involves either a ratio or a rate, using the proportion method.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM E - UNIT 4

WORD PROBLEMS (PERCENT)

OBJECTIVE

1. Solve a routine word problem which involves the use of percentage calculations, ratio or proportion.

UNIT 5 - MIXED OPERATIONS

ITEM A - UNIT 5

EQUIVALENTS (MIXED OPERATIONS)

OBJECTIVES

1. Convert:
    a. a common fraction or mixed number to a decimal fraction.
    b. a decimal fraction to a common fraction or mixed number.

2. Convert:
    a. a percent to a fraction.
    b. a fraction to a percent.

3. Convert:
    a. a percent to a decimal.
    b. a decimal to a percent.

4. Use standard tables to convert:
    a. a fraction to a percent.
    b. a percent to a fraction.

ITEM B - UNIT 5

ORDER OF OPERATIONS (MIXED OPERATIONS)

OBJECTIVES

1. Simplify an expression involving addition and subtraction of whole numbers or fractions.

ANNEX B

INSTRUCTIONAL OBJECTIVES

2. Simplify an expression involving addition and subtraction of whole numbers or fractions.

3. Simplify an expression involving addition and/or subtraction and multiplication and/or division of whole numbers or fractions.

4. Simplify an expression which requires the removal of parentheses.

5. Simplify an expression in which the numerator and/or denominator of a fraction is a sum, difference, product, or quotient of two whole numbers.

6. State the order in which order of operations rules apply.

7. Write a mathematical expression relating the facts in a given problem and then simplify that expression.

ITEM C - UNIT 5

OCCUPATION WORD PROBLEMS (MIXED OPERATIONS)

OBJECTIVE

1. Given word problems appropriate to a selected occupation, be able to: select arithmetic functions to be performed; the order in which they are to be done; and obtain the required solution.

ITEM D - UNIT 5

QUICK CALCULATIONS (MIXED OPERATIONS)

OBJECTIVE

1. Given appropriate occupational arithmetic calculation requirements the student will be able to perform the operations using common short cut methods.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 6 - ESTIMATE MEASURES

NB: The ability to estimate measurements is rarely included in academic programs. A high proportion of the occupations surveyed indicated that this is a requirement. It is also to be noted that many who require this skill do not also have to have the skill of actually measuring. The following criteria are appropriate to this item:

(1) Excessively small or large measurement estimates are not required. Extremes such as seconds - months, less than an ounce - over 100 lbs., less than a quarter inch - over 50 ft., less than one fluid ounce - over 10 gallons, should be avoided.

(2) Objects used should have a regular configuration of a circular, square or rectangular type.

(3) Students should be able to use various sensory organs, feel, see, handle, etc. It would not be realistic, for example, to ask a student to judge the weight of a sealed container without being able to lift it. Cognitive knowledge of the composition of various materials is not a requirement, e.g., hardwood is normally heavier than softwood.

(4) Few workers require all of the items in this unit and each item should therefore be treated independently of the other items.

ITEM A - UNIT 6

TIME (ESTIMATE MEASURES)

OBJECTIVES

1. Identify seconds, minutes, hours, days, weeks, months and years as units of time.
2. Convert units of time to other units (e.g., 90 minutes is 1 1/2 hours).
3. Be able to estimate the duration of time actually required to perform routine functions, within 50% of the actual time.

   NB: The routine functions selected should not be for excessively short or long durations.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM B - UNIT 6

WEIGHT (ESTIMATE MEASURES)

OBJECTIVES

1. Identify ounces, pounds and tons as units of weight measure.
2. Convert units of weight to other units (e.g., 32 ounces is 2 pounds).
3. Be able to estimate the weights of common objects within 20% of the actual weight.

   NB: The common objects should be items which the student could be expected to apply judgment by handling and not be excessively light or heavy.

ITEM C - UNIT 6

DISTANCE (ESTIMATE MEASURES)

OBJECTIVES

1. Identify inches, feet, yards and miles as units of distance.
2. Convert units of distance to other units (e.g., 18 inches = 1 1/2 feet).
3. Be able to estimate the length, width or height of common objects or the distance between objects, within 20% of the actual distance.

   NB: The objects or distance between objects should not be excessively short or lengthy distances but should be distances over which the student could be expected to apply judgment by visual inspection.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM D - UNIT 6

AREA (ESTIMATE MEASURES)

OBJECTIVES

1. Identify square inches, square feet, square yards as the measure of the surface of a figure.
2. Convert units of area to other units (e.g., 144 square inches equals one square foot).
3. Be able to estimate the area of common objects within 50% plus or minus of the actual area.

   NB: The common objects should be rectangular or square and not be excessively small or large.

ITEM E - UNIT 6

LIQUID VOLUME (ESTIMATE MEASURES)

OBJECTIVES

1. Identify fluid ounces, pints, quarts and gallons as units of liquid capacity.
2. Convert units of liquid measure to other units (e.g., 1 1/2 gallons equals 6 quarts).
3. Be able to estimate the liquid contents or the capcity of common containers, within 50% plus or minus of the actual content or capcity.

   NB: The common containers to be regular shaped bottles, tins, etc., of a circular, square or rectangular configuration without irregular constrictions except for the neck and not be excessively large or small.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM F - UNIT 6

SPATIAL VOLUME (ESTIMATE MEASURES)

OBJECTIVES

1. Identify cubic inches, cubic feet, and cubic yards as units of space measurement.
2. Convert units of space measurement to other units (e.g., 27 cubic feet equals one cubic yard).
3. Be able to estimate the cubic measurement of a common object or space, within 50% plus or minus of the actual size.

   NB; The common object or space to be a reasonable size (small as a book to as large as a classroom) and to be square or rectangular in configuration.

UNIT 7 - MEASURE

ITEM A - UNIT 7

SCALES (MEASURE)

OBJECTIVE

1. Visually read common scales, such as thermometers, weigh scales, clocks, water meters, gas meters, tape measures, pressure scales and odometers.

ITEM B - UNIT 7

TIME (MEASURE)

OBJECTIVES

1. Add and subtract 12-hour clock times including cases in subtraction where borrowing is required.

ANNEX B

INSTRUCTIONAL OBJECTIVES

2. Be able to measure the actual duration of time expended to perform routine functions, correct within 5% of actual duration.

ITEM C - UNIT 7

WEIGHT (MEASURE)

OBJECTIVES

1. Add and subtract weight measures including cases where borrowing is required.
2. Be able to weigh common objects on balance or spring loaded scales, correct within one unit of the scale readings.

ITEM D - UNIT 7

DISTANCE (MEASURE)

OBJECTIVES

1. Add and subtract units of distance including cases where borrowing is required.
2. Measure a given distance or one dimension of an object with a ruler or tape measure to the nearest 1/8 inch.

ITEM E - UNIT 7

QUANTITY (MEASURE)

OBJECTIVES

1. Add and subtract units of liquid measure including cases where re-grouping is required.

ANNEX B

INSTRUCTIONAL OBJECTIVES

2. Be able to measure liquid content or capacity of a container to within 1 unit of the scale on the measuring instrument.

ITEM F - UNIT 7

VERNIERS (MEASURE)

OBJECTIVE

1. Usually read, from pictorial representations of common verniers, the indicated measurement to the nearest unit.

UNIT 8 - METRIC MEASUREMENT

ITEM A - UNIT 8

WEIGHT (METRIC MEASUREMENT)

OBJECTIVES

1. Identify milligrams, centigrams, decigrams, grams, decagrams, hectograms, kilograms and metric tons as units of metric weight measure.
2. Convert units of weight from one metric unit to another (e.g., 100 grams equals one hectogram).
3. Be able to estimate the weight of common objects within 20% plus or minus of the actual metric weight.
4. Be able to weigh common objects on balance or spring loaded scales, correct within one unit of the metric scale readings.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM B - UNIT 8

DISTANCE (METRIC MEASUREMENT)

OBJECTIVES

1. Identify millimeters, centimeters, decimeters, meters, decameter, hectometers and kilometers as units of metric distance measure.
2. Convert units of distance from one metric unit to another (e.g., one hectometer equals 100 meters).
3. Be able to estimate the length, width or height of common objects or the distance between objects, within 20% plus or minus of the actual distance.
4. Be able to measure a given distance or one dimension object with a ruler or tape measure to the nearest centimeter.

ITEM C - UNIT 8

QUANTITY (METRIC MEASUREMENT)

OBJECTIVES

1. Identify milliliter, centiliter, deciliter, liter, decaliter and hectoliter as units of metric capacity.
2. Convert units of capacity from one metric unit to another (e.g., 10 liters equals one decaliter).
3. Be able to estimate in metric units the contents or the capacity of common containers, within 20% plus or minus of the actual content or capacity.
4. Be able to measure content or capacity of a container to within 1 unit of the scale of the measuring instrument.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM D - UNIT 8

WEIGHT CONVERSION (METRIC MEASUREMENT)

OBJECTIVES

1. Given tables, be able to convert metric weight measurements to English measurements.
2. Given tables, be able to convert English weight measurements to metric measurements.

ITEM E - UNIT 8

DISTANCE CONVERSION (METRIC MEASUREMENTS)

OBJECTIVES

1. Given tables, be able to convert metric distance measurements to English measurements.
2. Given tables, be able to convert English distance measurements to metric measurements.

ITEM F - UNIT 8

QUANTITY CONVERSION (METRIC MEASUREMENT)

OBJECTIVES

1. Given tables, be able to convert metric measures of capacity to English measurements.
2. Given tables, be able to convert English quantities to metric measurements.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 9 - DIMENSIONS

ITEM A - UNIT 9

FIGURES AND FORMS (DIMENSIONS)

OBJECTIVES

1. Identify rectangles, squares, triangles, circles, rectangular solids, cubes, pyramids, cones, cylinders and spheres from a set of objects, pictures of objects, or names of objects.
2. Identify:
    a. rectangles, squares, triangles, and circles as plane figures (two-dimensional).
    b. rectangular solids, cubes, pyramids, cones, cylinders, and spheres as solid figures (three-dimensional).
3. Identify rectangles, squares, triangles, circles, rectangular solids, cubes, and cylinders given their definitions or characteristics.

ITEM B - UNIT 9

DRAW/SKETCH (DIMENSIONS)

OBJECTIVES

1. Draw or sketch (not to scale) (student choice) squares, rectangles, triangles, circles, cubes, rectangular solids, cylinders, cones and pyramids.
2. Represent, by drawing or sketching (student choice), common objects using oblique projections.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM C - UNIT 9

READ SCALE DRAWINGS (DIMENSIONS)

OBJECTIVES

1. Identify 1:4, 6:1, 1" to the foot, 1" = 5 mi., 1:50,000, etc., as examples of scales used to represent reductions or expansions of the actual size of an object.
2. Convert a scale measurement to true size given the scale.
3. Identify a given drawing as a map, blue print, photograph, schematic diagram or assembly (exploded view) drawing.
4. Trace a particular subsystem on a single schematic drawing.
5. Identify the order in which parts are put together in an assembly drawing.

ITEM D - UNIT 9

MEASURE SCALE DRAWINGS (MEASUREMENTS)

OBJECTIVE

1. Calculate actual dimensions of an object given a ruler and a simple scale drawing of the object.

ITEM E - UNIT 9

DRAW TO SCALE (MEASUREMENTS)

OBJECTIVE

1. Given a compass, right angle triangle and a ruler be able to draw to scale front, top and side representations of common objects which are rectangular solids, cylinders, cones or pyramids.

ANNEX B

INSTRUCTIONAL OBJECTIVES

NB: For items B to E, emphasis should not be placed on drafting skills (line weight, corner construction, etc.) or on artistic skills (shading, balance, etc.) but on accuracy of reading measurements to and from, etc. In other words, can the student properly read the drawings and construct sketches or drawings which can be accurately read?

UNIT 10 - DIMENSIONS

ITEM A - UNIT 10

PERIMETER (DIMENSIONS)

OBJECTIVES

1. Identify perimeter as the length of the outer boundary of a plane figure and identify the units used as inches, feet, yards, etc.

2. Calculate the perimeter of a given rectangle or square.

3. Measure the perimeter of a given figure by successive ruler measurements. Identify as a constant equal to c/d for all circles and identify its approximate value as 3 1/7 or 3.14.

4. Calculate the circumference of a circle given:
   a. its radius
   b. its diameter

5. Solve a routine word problem involving perimeter.

ITEM B - UNIT 10

AREA (DIMENSIONS)

OBJECTIVES

1. Identify area as the measurement of the surface of a figure and state units used. (sq. in., sq. ft., sq. yd., sq. mi.)

ANNEX B

INSTRUCTIONAL OBJECTIVES

2. Calculate the area of a given square.
3. Calculate the area of a given rectangle.
4. Calculate the area of a given triangle.
5. Calculate the area of a given circle.
6. Solve practical problems involving area calculations of squares, rectangles, triangles, and circles.

ITEM C - UNIT 10

VOLUME (DIMENSIONS)

OBJECTIVES

1. Calculate the volume of a given rectangular solid (including cubes).
2. Calculate the volume of a given cylinder.
3. Solve practical problems involving volume calculations of rectangular solids and cylinders.

ITEM D - UNIT 10

READ GRAPHS (DIMENSIONS)

OBJECTIVE

1. Read specified data from simple line, bar and circle graphs.

ITEM F - UNIT 10

CONSTRUCT GRAPHS (DIMENSIONS)

OBJECTIVE

1. Given simple data construct line, and bar graphs to display a visual representation of the data.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 11 - ALGEBRA

ITEM A - UNIT 11

ONE VARIABLE (ALGEBRA)

OBJECTIVES

1. Write single variable open sentences given verbal statements of relations.
2. Solve single variable open sentences.
3. Solve routine word problems which require equations in one unknown.

ITEM B - UNIT 11

TWO VARIABLES (ALGEBRA)

OBJECTIVES

1. Write two variable open sentences given verbal statements of relations.
2. Solve two variable open sentences.
3. Solve routine word problems which require equations in two unknowns.

ITEM C - UNIT 11

QUADRATICS (ALGEBRA)

OBJECTIVES

Not established.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM D - UNIT 11

VARIATIONS (ALGEBRA)

OBJECTIVES

Not established.

UNIT 12 - TRIGONOMETRY

ITEM A - UNIT 12

LOGARITHMS (TRIGONOMETRY)

OBJECTIVES

1. Solve multiplication problems by using logarithm tables.
2. Solve division problems by using logarithm tables.

ITEM B - UNIT 12

SLIDE RULE (TRIGONOMETRY)

OBJECTIVES

1. Solve multiplication problems by using a slide rule.
2. Solve division problems by using a slide rule.
3. Solve exponent and root problems by using a slide rule.

ITEM C - UNIT 12

CALCULATION (TRIGONOMETRY)

OBJECTIVES

Not established.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 13 - LISTEN

NB: The audio tapes should contain a variety of simulated occupational listening conditions.

ITEM A - UNIT 13

LITERAL COMPREHENSION (LISTEN)

OBJECTIVES

1. Listen to an audio tape and be able to answer "what", "who", "where", and "when" questions.
2. Listen to an audio tape and be able to identify the order or sequence of required activities.
3. Listen to an audio tape and be able to identify the latitude allowed by the speaker.
4. Listen to an audio tape and be able to perform a series of activities that requires recall of instructions or information.

NB: The students to be encouraged to take notes during the playback and to be aware of the objectives (but not the actual test items). This item is intended to develop the skills of effectively listening for the factual aspects of oral communication.

ITEM B - UNIT 13

INTERPRETIVE COMPREHENSION (LISTEN)

OBJECTIVES

1. Listen to an audio tape and be able to identify the main purpose of the talk.
2. Listen to an audio tape and be able to answer "how" and "why" questions.
3. Listen to an audio tape and be able to answer questions which require a generalized interpretation of the talk.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM C - UNIT 13

EVALUATIVE COMPREHENSION (LISTEN)

OBJECTIVES

1. Listen to an audio tape and be able to identify speakers' statements as being facts or opinions.
2. Listen to an audio tape and be able to perform a series of activities that requires recall of instructions or information AND interpretive and evaluative comprehension.

NB: Items B and C: operant as well as respondent behavior are important in these two items. It should not be expected that students achieve conformity of conclusions, rather it should be expected that they be able to defend or support their interpretive and evaluative comprehension.

UNIT 14 - TALK

ITEM A - UNIT 14

DIRECTIONS/INSTRUCTIONS (TALK)

OBJECTIVES

1. Organize and express directions in a logical sequence and with time limitations, given direction content.
2. Answer questions orally which require interpretation of an experience.

ITEM B - UNIT 14

INFORMATION (TALK)

OBJECTIVES

1. Repeat information which has been told.

ANNEX B

INSTRUCTIONAL OBJECTIVES

2. State the correct answer to questions on a subject about which information has been given.

3. Describe orally, in a few short sentences, a given person, place, thing, or job performed.

4. Answer questions orally about material read (such as a note, memo or letter).

5. Describe an experience or some event that was witnessed (or read about).

6. Explain to someone else how to perform a fairly complex task, given experience at performing the task, or having learned from another person or a manual how to perform the task.

ITEM C - UNIT 14

QUESTIONS (TALK)

OBJECTIVE

1. Given a short statement of a typical and realistic occupational problem and a coach or peer who has a list of facts pertinent to the problem each student will be able to obtain at least 51% of the facts by asking information seeking questions.

   NB: Items A and B are intended to develop skills of imparting information and instructions. The exercises and tests should be carefully designed to ensure that memory or understanding is not being tested. In item C the ability to obtain facts or opinions by questioning, rather than the ability to frame "proper" questions, is the essential skill.

ITEM D - UNIT 14

FORMAL TALKS (TALK)

OBJECTIVE

Not established.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 15 - READ

NB: Memory is not involved in these objectives. The written material (up to Grade level 8.5 Fry Readability Scale) supplied to the student should be available to the student during performance.

ITEM A - UNIT 15

LITERAL COMPREHENSION (READ)

OBJECTIVES

1. Identify statements as being true or false after reading a given selection.

2. Answer "what", "who", "where", and "when" questions using factual information from a given selection.

3. Given a set of instructions involving activities to be performed by a number of people, and the particular role, prepare a list and sequence of activities to be performed.

ITEM B - UNIT 15

INTERPRETIVE AND EVALUATIVE COMPREHENSION (READ)

OBJECTIVES

1. Answer "why" and "how" questions using factual information from a given selection.

2. Answer questions which require a generalized interpretation which can be inferred from facts in a given selection.

3. Identify causes and effects from a given selection.

4. Identify and support a conclusion that can be inferred from a set of facts or from a given selection.

ANNEX B

INSTRUCTIONAL OBJECTIVES

5. Identify and support a prediction based on information given in a selection.

6. Separate facts and opinions in a given selection.

7. Given a set of instructions involving literal, interpretative and evaluative comprehension, and a statement of the current situation, prepare a list and sequence of activities to be performed.

ITEM C - UNIT 15

COMPARATIVE EVALUATION #1 (READ)

OBJECTIVE

1. Compare two or more written directions and identify discrepancies.

ITEM D - UNIT 15

BOOKS (READ)

OBJECTIVES

1. Be able to locate a telephone number, address or business firm from a telephone directory.

2. Be able to locate an item and its cost and catalogue number from a catalogue.

3. Be able to obtain the correct spelling for a word from a dictionary.

4. Be able to locate a particular reference in a reference book or company manual.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM E - UNIT 15

COMPARATIVE EVALUATION #2 (READ)

OBJECTIVE

1. Be able to locate similar information from two or more catalogues, books or manuals and determine which one is most suitable based on given criteria such as price, delivery date, color, size, etc.

ITEM F - UNIT 15

COMPARATIVE EVALUATION #3

OBJECTIVE

1. Be able to locate similar information from two or more books, catalogues or manuals, set criteria and determine which one is the most suitable on the criteria established.

UNIT 16 - BUSINESS READ

ITEM A - UNIT 16

NOTES, LETTERS OR MEMOS (BUSINESS READ)

OBJECTIVE

1. Given notes, letters or memos, be able to identify:
    - a. the author
    - b. the recipient
    - c. the activities required of the recipient

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM B - UNIT 16

FORMS (BUSINESS READ)

OBJECTIVE

1. Given a variety of common business forms such as work orders, job orders, issue and receipt vouchers, claims and purchase orders, be able to answer factual questions based on the data on the forms.

ITEM C - UNIT 16

CHARTS (BUSINESS READ)

OBJECTIVE

1. Given common reference tables and charts such as organization charts, parts charts, reference tables, including charts and tables designed in matrix form (rows and columns), be able to answer factual questions based on the data supplied.

ITEM D - UNIT 16

MANUALS (BUSINESS READ)

OBJECTIVE

1. Given a typical company manual or union agreement containing administrative, policy, personnel and financial rules and regulations, be able to answer factual questions based on the manual for items such as hours of work, rates of pay, vacation or other leave, grievances, promotion and discipline.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 17 - WRITE

ITEM A - UNIT 17

PHRASES (WRITE)

OBJECTIVE

1. Given simple data in the form of words and figures the student will be able to write phrases which are legible and which convey the desired information.

ITEM B - UNIT 17

SENTENCES (WRITE)

OBJECTIVE

1. Given simple data in the form of words and figures the student will be able to write complete sentences.

   NB: The data obtained indicates that some occupations only write by filling in phrases and sentences on forms. Therefore, the only criteria for items A and B is whether or not the phrase or sentence would be understood. Correct use of capital letters, punctuation, spelling, tense, etc., although desirable, is not critical at this level of performance.

ITEM C - UNIT 17

PARAGRAPHS (WRITE)

OBJECTIVES

1. Given simple data in the form of words and figures the student will be able to write sentences using capital letters, punctuation, modifiers and spelling correctly.

ANNEX B

INSTRUCTIONAL OBJECTIVES

2. Write a short article or report of four or five paragraphs using proper sentence structure, word usage, punctuation, and paragraph form, on a topic of interest.

ITEM D - UNIT 17

FORMS (WRITE)

OBJECTIVES

1. Given typical employment application forms the student will be able to complete them correctly, neatly and legibly.
2. Given typical business forms such as work orders, job orders, issue and receipt vouchers, claims, and purchase orders and the necessary data in words and figures, the student will be able to correctly complete or fill in the appropriate portions of the forms.

ITEM E - UNIT 17

MEMOS (WRITE)

OBJECTIVES

1. The student will be able to set up the parts of a business memo in proper form, sender's name and/or appointment, data, addressee's name and/or appointment, subject heading, body and signature.
2. Compose business memos in proper form using good sentence and paragraph structure and proper punctuation, from information supplied.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM F - UNIT 17

LETTERS (WRITE)

OBJECTIVES

1. The student will be able to set up the parts of a business letter in proper form, (sender's address, date, addressee's address, salutation, body, complementary close and signature).

2. Given the information for a letter the student will be able to organize the body of the letter into a logical sequence, such as the following:

    a. An introduction which describes the purpose or aim of the letter (why it is being written).
    b. A background or history so the reader can understand the discussion which follows.
    c. The discussion necessary for the reader to know the current facts on the arguments presented.
    d. A closure which includes the recommendation, decision, action requested or summary.

3. Compose business letters in proper form, using good sentence and paragraph structure, logical sequences, proper punctuation and spelling, from information supplied.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 18 - WRITE REPORTS

ITEM A - UNIT 18

INFORMATION REPORTS (WRITE REPORTS)

OBJECTIVE

1. Given real or simulated occupational conditions in which the student can use a variety of his senses, the student will be able to prepare a written factual report which is correct, concise and reasonably complete.

ITEM B - UNIT 18

RECOMMENDATION REPORTS (WRITE REPORTS)

OBJECTIVES

1. Given a typical and simple type of occupational problem the student will be able to select alternative courses of action to alleviate or solve the problem.

2. Given a typical and simple type of occupational problem and a list of alternative courses of action to alleviate or solve the problem the student will be able to list advantages and disadvantages for each alternative.

3. Given real or simulated occupational problems in which the student can use a variety of his senses, the student will be able to prepare a recommendation report which includes alternatives, courses of action to alleviate or solve the problem and the advantages and disadvantages of each.

   NB: The condition for items A and B could be an actual activity or a film. The students should be aware of any facts which would already be known to the recipient of the report so that he would only have to report what his supervisor needs to know. The problems selected must be of a nature where the student could be expected to apply judgment on the problem and the alternatives.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM C - UNIT 18

SORT (WRITE REPORTS)

OBJECTIVE

1. Given data or objects and a classification criteria the student will be able to sort the data/objects by the various classifications.

   NB: The data/objects and the classification criteria should require a minimum of judgment. The ability to sort rather than the ability to apply judgment is the essential criteria for this objective. The exercises and tests for this objection and for the following items should go beyond the idea of sorting for filing, such as sorting for warehousing, sorting tools and materials, sorting figures and vouchers.

ITEM D - UNIT 18

CLASSIFY (WRITE REPORTS)

OBJECTIVE

1. Given data or objects such as receipts and expenditures or pictures of a variety of objects which can be readily classified by different lists, the student will be able to set up a classification system and sort the data/objects by the various classifications.

   NB: The data/objects should be presented in a way that there is an apparent need to sort them for various reasons such as filing, warehousing, providing information. The student should be aware of "why" he has to classify them and the desired skill is "how to classify".

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM E - UNIT 18

TECHNICAL REPORTS (WRITE REPORTS)

OBJECTIVES

Not established.

UNIT 19 - EXCHANGE IDEAS

ITEM A - UNIT 19

DEBATE (EXCHANGE IDEAS)

OBJECTIVES

1. The student will be able to withhold judgment while listening or reading.

2. The student will be able to clarify points not understood as a result of listening or reading.

3. The student will be able to apply judgment to material heard or read after he has understood the other's intent, and then state his reaction in oral or written form.

4. The student will be able to state his point of view in oral and written form and defend the point in subsequent communication.

NB 1: Although these objectives suggest a high degree of skill the tests and learning processes should be at an unsophisticated level. Preferably the same material (oral and written) should be used for each objective so the student will learn to systematically follow these steps.

NB 2: Interpersonal behaviors necessary to supplement these skills will be identified as part of the "people" analysis to be carried out at a later date. At that time, the higher level skills of persuading and negotiating will be examined.

NB 3: The above objectives are only intended for the one to one level of communication.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM B - UNIT 19

PEER DEBATE (EXCHANGE IDEAS)

OBJECTIVES

1. The student will be able to identify the fact that, in oral or written conversation with customers, workers' comments, points of view and ideas are accepted as company policy and that the company for which he works will probably morally and legally have to comply with any commitments which the employee makes.

2. Given case studies of conversations between customers and employees the student will be able to decide:

   a. Whether to give the customer a final decision and what the decision should be, or;

   b. Ask the supervisor to make the decision.

3. Given case studies of discussions between fellow workers the student will be able to decide:

   a. Whether to compromise, accept the viewpoints of the other, or retain his own viewpoint and then state his decision in oral or written form, or;

   b. Ask the supervisor to make the decision.

ITEM C - UNIT 19

SUPERVISOR DEBATE (EXCHANGE IDEAS)

OBJECTIVES

1. The student will be able to identify the fact that, in a debate between worker and supervisor, the worker is normally expected to seek clarification of supervisor's instructions and to make the final decision to compromise, accept or reject the employee's point of view.

2. The student will be able to perform objectives 1 to 4 of Item A, in oral form, with a person who is, or appears to be, a person of authority.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM D - UNIT 19

CONFERENCES (EXCHANGE IDEAS)

OBJECTIVES

1. In a conference situation with peers and a person of authority the student will be able to:

   a. State his point of view or supply factual information when asked.

   b. Contribute to the discussion by:
      (1) building on previous discussion; and
      (2) introducing single concepts at a time.

   c. Take notes for any future activities which are his responsibility.

   NB: Units A, B and C are intended for the one to one level of communication. In unit D the skills are those of a participant in a conference and not those of the chairman or supervisor. Business conferences rarely take the form of a "meeting" of the type that involves making motions and other parliamentary procedures.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 20 - DIAGNOSE

ITEM A - UNIT 20

LIST CAUSES (DIAGNOSE)

OBJECTIVES

1. Given a series of facts pertinent to a simple problem situation composed of statements which are either symptoms (effects of) or problems (causes of) the student will be able to correctly identify the statements as symptoms or problems.

2. Given a series of facts pertinent to a simple problem composed of statements which are either symptoms or problems, and statements which are neither, the student will be able to correctly identify the symptom and problem statements.

3. Given a series of symptom facts pertinent to a simple problem the student will be able to prepare a list of the possible problems.

ITEM B - UNIT 20

LOOK UP CAUSES (DIAGNOSE)

OBJECTIVE

1. Given a series of symptom facts pertinent to a simple problem and a chart or written material which describes common cause - effect relationships, the student will be able to prepare a list of the possible problems.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM C - UNIT 20

SET PRIORITIES (DIAGNOSE)

OBJECTIVES

1. Given a series of symptom and problem facts pertinent to a simple problem situation which has a cause - effect relationship between two or more symptoms, the student will be able to trace the symptom - problem relationship.
2. Given a list of possible symptoms and problems for a simple problem and their relationship the student will be able to establish a priority list for problem identification.
3. Given a series of symptom facts pertinent to a simple problem situation the student will be able to identify possible problems and establish a priority list for problem identification.

ITEM D - UNIT 20

LOOK UP METHODS (DIAGNOSE)

OBJECTIVE

1. Given a simple problem situation, with: the possible symptoms and problems identified; the possible symptom/problem relationship established; a list of priorities for problem identification; and an instructional manual which describes how to check for faults; the student will be able to identify the appropriate portions of the manual.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM E - UNIT 20

PROBING QUESTIONS (DIAGNOSE)

OBJECTIVES

1. Given a simple problem situation in which possible cause-effect relationships can be identified by questioning and a list of possible problems with their priorities, the student will be able to eliminate in order possible problems by asking probing questions until the problem has been identified.

2. Given a simple problem situation in which possible cause-effect relationships can be identified by questioning, the student will be able to prepare a list of the possible problems, establish a priority list and eliminate in order possible problems by asking probing questions until the problem has been identified.

ITEM F - UNIT 20

USE SENSES (DIAGNOSE)

OBJECTIVES

1. Given a simple problem situation in which possible cause-effect relationships can be identified by sensory organs (touch, see, smell, or taste) and a list of possible problems with their priorities, the student will be able to eliminate in order the possible problems by the use of his senses until the problem has been identified.

2. Given a simple problem situation in which possible cause-effect relationships can be identified by sensory organs, the student will be able to prepare a list of possible problems, establish a priority list and eliminate in order possible problems by the use of his senses until the problem has been identified.

ANNEX B

INSTRUCTIONAL OBJECTIVES

UNIT 21 - LATITUDE

ITEM A - UNIT 21

SIMPLE INSTRUCTIONS (LATITUDE)

OBJECTIVE

1. Given simple instructions of the nature of, "If this happens - do that", in oral or written form, the student will be able to recall and comply with the instructions, when appropriate.

ITEM B - UNIT 21

COMPLEX INSTRUCTIONS (LATITUDE)

OBJECTIVE

1. Given instructions of the nature of, "If A and B happen, do X, but if A and C happen, do Y", in oral or written form the student will be able to recall and comply with the instructions, when appropriate.

ITEM C - UNIT 21

COMPOUND INSTRUCTIONS (LATITUDE)

OBJECTIVE

1. Given a work situation and instruction of the nature of, "If A and B happen use your judgment whether to do X, Y, or Z", the student will be able to recall the instruction, decide on and take appropriate action when appropriate.

ANNEX B

INSTRUCTIONAL OBJECTIVES

ITEM D - UNIT 21

SET PRIORITIES (LATITUDE)

OBJECTIVE

1. Given a hypothetical working situation, a list of both routine and unique tasks to be performed, deadlines which have been established for completion of certain tasks, and estimates of time to perform each task, the student will be able to establish a work priority list.

CHAPTER IV

THE INDIVIDUALIZED LEARNING PROCESS

V. W. Mullen*

A. INTRODUCTION

The Training Research and Development Station has developed a program in basic education to prepare undereducated adults as quickly as possible to enter vocational training and to handle the requirements of reading, writing and arithmetic in everyday life. The program had to cover an academic range from about Grade 5 to Grade 10, the level specified by most provinces as the necessary prerequisite to training in vocational skills. The program, known as LINC: Learning Individualized for Canadians, is now being extended to cover the fuller range of skills.

The program is individualized adult basic education, thus making possible a system of continuous intake and exit. Such a system allows adult students to enter a program whenever they are ready, and leave without waiting for a fixed graduation day. Other students can be enrolled to fill a training place as soon as it becomes vacant. In that way, there can be more effective use of instructors and classrooms, costs per training day can be lowered, and students waste less time in training.

The LINC program satisfies these needs at two levels of individualization; it is arranged so that provinces can adapt it easily to meet their varying requirements of standards and content, and its systems approach provides a process of complete individualization for continuous intake and exit.

Basically, its content satisfies the core requirements of all or most provinces, but its process allows content units to be added, subtracted, or changed to fit a range of provincial curricula. Its system of prescription allows each teacher to include his own favourite textbooks and methods. Its system of evaluation allows criteria at check points to be adjusted to fit local standards. Courses other than the mathematics and communications of the LINC program can be modelled on its process. LINC thus serves as a framework on which to build the variations required by the provinces and the institutions which provide adult basic education in each province.

---

* Chief, Adult Development Division
Training Research and Development Station

B. THE LINC PROGRAM

The LINC program package may be considered from three points of view: the components, the content, and the process.

Components

The components are the three courses: Mathematics, Developmental Reading, and Functional Reading. Developmental Reading is concerned with teaching the skills of receiving oral and written information and comprehending, interpreting and evaluating it. Functional Reading, on the other hand, deals more with transmitting information, mostly by writing, and with the usages which make correct writing possible.

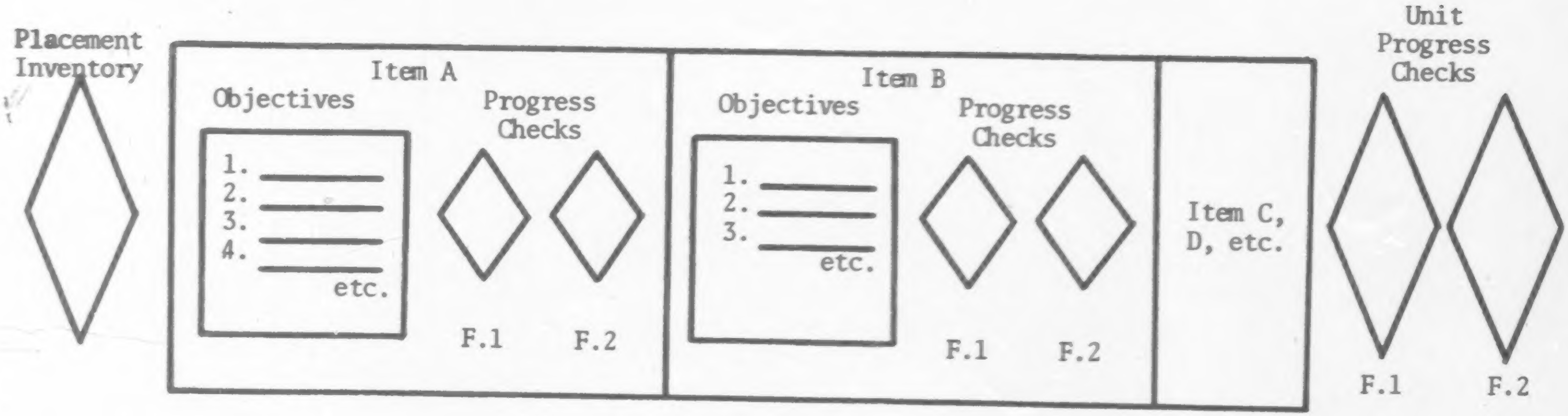
Content

Behavioural objectives define the content of the program in a range of difficulty from about Grade 5 to Grade 10. To make the individualized process work, objectives are grouped into homogeneous concept items, and items in turn are arranged in units. Mathematics, for example, has ten units subdivided into a total of 45 items which in turn include 266 learning objectives. (See Table 1: The Organization of a LINC Unit.)

The objectives make the heart of the LINC program. They keep the units internally consistent, and they control the stages of difficulty by their grading. All the evaluation instruments - the placement inventory, the short term item checks, and the longer range unit checks - are based on the item objectives. Evaluation and even student progress is expressed visually when a student crosses each objective off his chart after he has shown mastery of it at both the item and unit level; the chart of objectives shows both student and instructor what he has done and what remains to be done for him to complete the program. Thus progress is rated not in terms of a series of percentage marks but of objectives for which the criterion has been met. Students are expected to master every objective in the program; some do it quickly and others more slowly. Time, then, and not what fraction of a program a student has passed an examination on, becomes the individual variable. (Note that content will also be an individual variable in the revision now being prepared for data skills.)

The content of LINC was limited to Mathematics and various aspects of Communications as core necessities in providing students with at least the minimum essentials to qualify to enter vocational training, to get an academic certificate that would open doors to jobs which require that level of education, and to cope with the practical needs of daily living. Now, for the Generic Skills project, LINC is being extended to include the mathematics and communications skills required as part of vocational training.

TABLE 1: The Organization of a LINC Unit


Placement Inventory
Item A
Objectives
1.
2.
3.
4.
etc.
Progress Checks
F.1
F.2
Item B
Objectives
1.
2.
3.
etc.
Progress Checks
F.1
F.2
Item C, D, etc.
Unit Progress Checks
F.1
F.2

This unit organization is repeated throughout the program, with varying numbers of items in each unit, varying numbers of objectives in each item, and two forms of each progress check.

Process

The process is the system of diagnosis, placement, prescription and evaluation which makes possible the individualization of the program, both for the student in the classroom and for the institution that wishes to adapt the program to suit its own requirements. (See Table 2: Individualized Process.)

The process is designed for individualized instruction of students in three well-defined steps:

1. Diagnosis and Placement

Every unit in the program begins with a placement inventory in which there is at least one question on every instructional objective in the unit. Students are placed according to the objectives they are unable to meet. When a course begins, everybody may take the placement inventory for Unit 1 of a course at the same time, but the students soon spread out. Some students make mistakes immediately and they must be assigned work on the unit. Other students may breeze through several placement inventories before they have to stop. Within a short time, all the students are working at different levels. As students complete the program or drop out to take jobs or for other reasons, other students take their empty seats in a continous intake-exit situation. These new entrants start with the first placement inventory themselves. Thus after the first day there is no set time for placement testing; it must go on continually.

Placement is important for adult students who are returning to school after a number of years away. They want to find out what they know and what they don't know, what they have completed and what they still have to finish to reach a certain goal. Placement related to objectives forces a student to face the truth of his functioning level; he cannot hide behind a vague grade level. Placement helps to make him responsible for his own learning, and that is an important aspect of an individualized program for adults. Furthermore, as he shows mastery of certain objectives, either on placement inventories or further evaluation checks, he feels a sense of satisfaction and accomplishment.

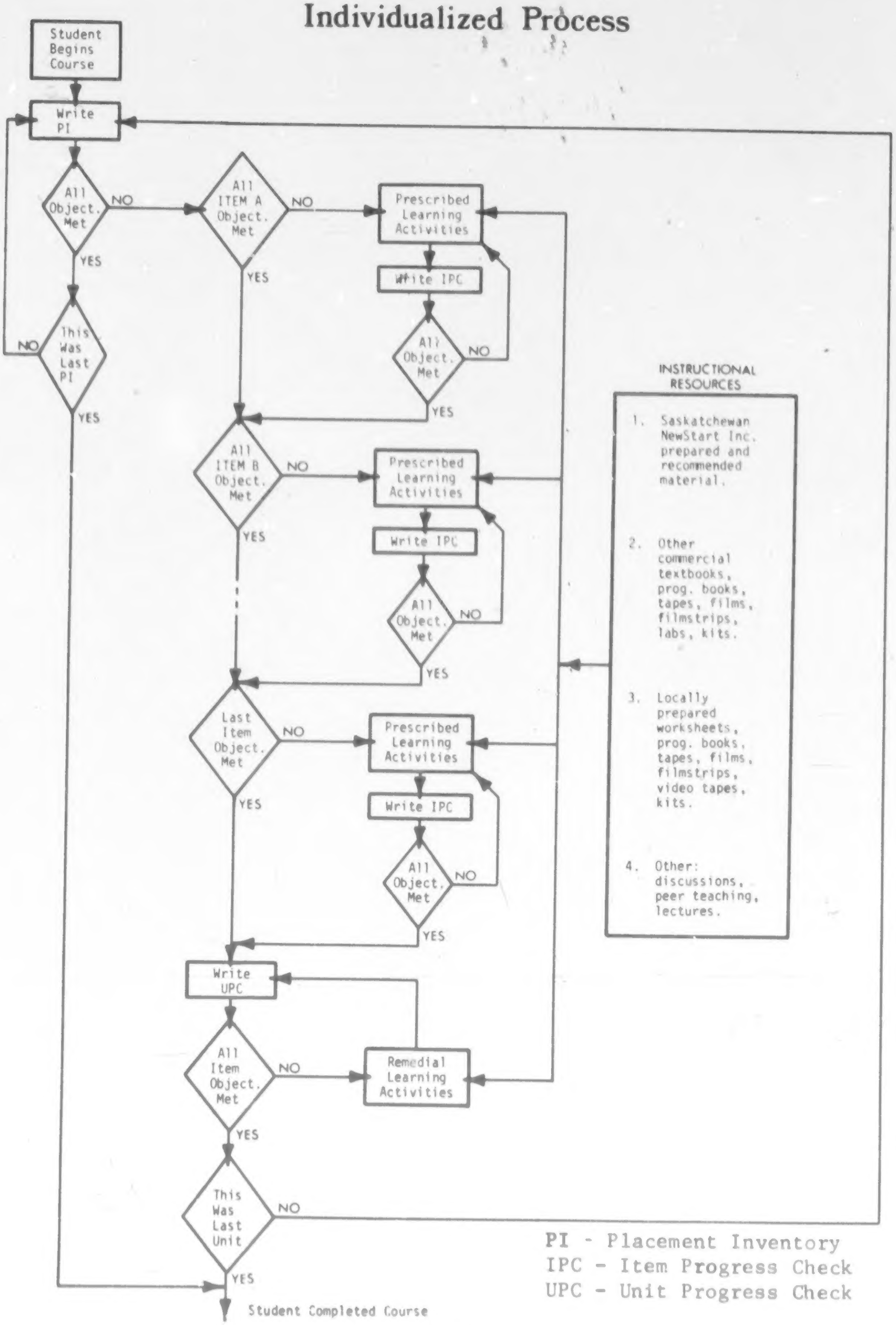
At the same time, by diagnosing a student's weaknesses and strengths and by placing him correctly, an instructor begins to understand him. Placement is the first step in a fuller diagnosis of the student's capabilities, so that during the whole training program the instructor can prescribe the best materials and use the best methods to fit the student's level and to match his particular learning abilities.

2. Prescribed Learning Activities

Before an instructor can prescribe work successfully for an adult student, he has to do more than analyze his mistakes on paper. At the prescription stage the instructor should sit down with each student,

TABLE 2

Individualized Process


Student Begins Course
Write PI
All Object. Met
NO
YES
This Was Last PI
NO
YES
All ITEM A Object. Met
NO
YES
Prescribed Learning Activities
Write IPC
All Object. Met
NO
YES
All ITEM B Object. Met
NO
YES
Prescribed Learning Activities
Write IPC
All Object. Met
NO
YES
Last Item Object. Met
NO
YES
Prescribed Learning Activities
Write IPC
All Object. Met
NO
YES
Write UPC
All Item Object. Met
NO
YES
Remedial Learning Activities
This Was Last Unit
NO
YES
Student Completed Course

INSTRUCTIONAL RESOURCES

1. Saskatchewan NewStart Inc. prepared and recommended material.
2. Other commercial textbooks, prog. books, tapes, films, filmstrips, labs, kits.
3. Locally prepared worksheets, prog. books, tapes, films, filmstrips, video tapes, kits.
4. Other: discussions, peer teaching, lectures.

PI - Placement Inventory
IPC - Item Progress Check
UPC - Unit Progress Check

examine the mistakes he has made and relate them to the objectives which state what must be learned. The student must learn to face his mistakes and realize what has to be done to overcome them.

In this personal contact, the instructor can begin to develop the one-to-one relationship which is so important in adult basic education. Perhaps personal and social difficulties may be explored at the same time as the academic. The instructor may not be able to perform fully as a counsellor or to settle the student's life problems at this point, but he can at least lend a sympathetic ear. The ability to establish a good relationship with a student, to show empathy and understanding, may be more important attributes in an instructor than pedagogical skills.

The instructor's big task in prescribing is matching materials and methods with an individual's learning needs. Because in most training programs there are adults with different backgrounds of knowledge as well as differing interests and capabilities, no single textbook or set of materials can satisfy all the individual requirements. Some people learn best in short steps, others in longer ones; some grasp new principles quickly, others need more explanations or more examples or more reinforcement. A set of books aimed at the average adult student (or, too often in adult programs, the average child) can satisfy neither the slow learner at one end of the scale nor the fast learner at the other. Some students prefer programmed materials, with a chance to check results after every frame; others prefer workbooks with lots of drill on every new concept; still others feel cheated if they are not given an old-fashion textbook such as they may have used in school years before.

The same observations have been made about methods. One student learns best by reading a textual explanation, another by looking at a visual presentation or illustration, a third by hearing an explanation. A student may freeze during a teacher's explanation and not remember a word, but he may absorb fully the explanation of a peer for whom he has no fear, especially if that person has just faced the same problem and has overcome it. Some students still want to learn in traditional class groups, with the instructor giving a group lesson with assignments based on it.

Thus the instructor must be prepared to draw on a wide repertoire of materials and approaches in order to match them in his prescriptions for the particular needs of a particular student. This means that an instructor must be well acquainted with a good stock of resources. He must know their strengths and weaknesses and their suitability for different students. He has to be able to orchestrate them progressively in his prescriptions, bringing them in at the right moment, particularly in reading programs. Finally, if commercial materials and the usual methods fail, a good instructor must be capable of creating his own materials and methods to zero in precisely on the student's problem.

The LINC program recommends only a basic set of commercial books for classroom use. Each classroom needs only a few copies of each since students are working at different levels, perhaps on different courses, at one time. Any institution implementing the LINC program may use their own supply of materials instead of those recommended or they can add them to the basic set to make it more comprehensive.

3. Evaluation

The LINC program has three levels of evaluation. At first the placement inventory reveals the item and objective each student must start work on. When a student completes work on all the objectives of an item, and both the instructor and the student are satisfied that he is ready for the test, he takes the item progress check immediately. If he reaches the criterion score, he continues work on further items until he completes the unit. He then takes the unit progress check, which tests the objectives of all the items in an integrated way. A final evaluation when the student has completed the course checks the student's retention of all the objectives in the course. (See Tables 1 and 2).

All the item and unit progress checks have two forms. The recommended criterion on all Form 1 checks is complete mastery. A mistake indicates the need for a further prescription, preferably with different materials or a new method, to give the student a fresh opportunity to overcome his difficulty. After remedial work he tries Form 2 of the check.

Criterion scores recommended for Form 2 checks are about 90% and there is a "Teacher's Judgment" safety valve to let students proceed or do further remedial work in borderline cases.

Instructors must stress to students that evaluation is for diagnostic and remedial purposes and not for the usual percentage mark to place them on a scale with other students to see if they pass or fail. Gradually both the instructor and the student should come to treat evaluation as a source of learning more about the student himself, his strengths and weaknesses, and the methods and materials best suited for his learning needs.

The cycle of testing, individual prescription, individual work with varying materials and methods, and individual evaluation continues throughout the program.

C. THE INSTRUCTOR IN THE CLASSROOM

Training instructors for the LINC program includes introducing them to a new role in the classroom. This role differs greatly from that of the teacher in the traditional classroom. The LINC process itself, as a vehicle for new approaches and a new role for instructors, does, if they follow it conscientiously, force them to change their ways. However, they can change more effectively when they are made conscious of the contrast between the role of instructor as a planner of lessons, class lecturer, and the role of diagnostician, prescription specialist, personal instructor and counsellor, and the classroom manager of systems and materials.

The LINC program releases an instructor from preparing daily lessons to spend more time with students who need his help. He can call on students to do peer teaching when he cannot keep up with all the personal demands for assistance. There is no better way for a student to reinforce or consolidate what he has just learned than to teach it to another. There can be more than the recommended 15 adults in a LINC classroom if the instructor can organize efficient peer teaching.

An instructor has to learn to promote a changed physical and social environment in the classroom. There must be classroom rules, but the students themselves ought to participate in making them and in disciplining themselves. They may want to be free to move around the classroom, to change the furniture, to sit and work in small groups or individually, to break up the straight rows, to help others and get help as they require, to smoke or to drink coffee while working. One of the most difficult social changes to make in the classroom is to drag the teacher out from behind his desk, to stop him from using it as a protective shield between himself and his students. The successful teacher of adults has to work from within the group and not from outside it.

An anecdote about a new LINC classroom in one of the eastern provinces describes an important visitor. He could not distinguish the instructor from the students, he was puzzled to find a student working permanently at the teacher's desk over against the wall, and he was somewhat chagrined that everybody kept on working and paid little attention to him. His comment was that he had never visited a classroom like that before.

Adults often enter upgrading or retraining programs with built-in insecurity and fears: fear of failing again, fear of being laughed at or made to feel foolish, fear that all the other students will do well but that they won't measure up, fear of an imposing building and of an educational system not really meant for them, and fear of a well-educated instructor who is far above them. The fears may be irrational, but they are nevertheless present, and they must be understood.

Then there are physiological lacks, especially among the economically disadvantaged. Students may have failing eyesight or hearing and not be conscious of it; they may find it difficult to sit still in a confined space for several hours or even to hold a pencil. They may suffer from poor health or malnutrition because of unwise eating habits, or from insufficient sleep because of an irregular life style. Excessive use of alcohol or drugs may have impaired their intellectual acuity.

Instructors must learn to consider the sociological factors regarding the whole culture of the undereducated in relation to unemployment, under-employment and welfare. Their adult students may find it difficult to communicate. They may resent impersonal treatment, and they will certainly not want to be treated as children. Anxieties about family, financial matters, health, and jobs may nag them continually, making it difficult for them to concentrate on the facts and figures in their lessons.

On the other hand, instructors need to learn to take advantage of the positive strengths that adults have, their wide ranging experiences, knowledge of life, ability to use reason, and their strong motivation to succeed when they realize the value of a goal and their own capability to achieve it.

With understanding, the instructor can lead a student on to face his own mistakes and to do something about them, to make him realize that he is not doing work for the teacher but for himself. These are steps leading to responsibility for his own self-concept. In a program geared for his skill level, in which he is carefully placed and given work that he can do, he may begin to feel academically successful for the first time in his life. The effect will give him more self-respect. He will come to believe that he is capable of learning, and that he can move up a career ladder if he improves his academic level. A feature of the LINC program in use is that many students, realizing success in learning, develop more ambition and higher expectations. Adult basic education gives them more than a certificate or entry into further training; it gives them self-confidence and a better control of their own lives.

Both professionals and para-professionals can become excellent instructors for adults. Each has his own strengths. The para-professional may be more successful immediately in establishing a good working relationship with students; students may fear him less and be more willing to ask his help or to confide their problems to him as one who "understands their language". On the other hand, a professional teacher is generally better able to diagnose learning difficulties and to prepare his own remedial work sheets to help students overcome particular difficulties. If on top of his pedagogical skills he can also establish a sympathetic relationship with his students, the professional instructor can maintain his place as the best person for the job.

D. LOCALIZING THE LINC PROGRAM

Part of the training of instructors must be to help them to adapt the program to meet the standards and curriculum requirements of their own institution or province.

Adaptation may be as simple as changing place names in word problems and exercises in order to give a local flavour to the content. At a slightly higher level, instructors may want to add a few more objectives or items, or even to create a completely new unit. They can adapt the program gradually, starting with a full program on Day 1 of any training period and modifying it as time goes by or as needed change becomes apparent. In some cases, instructors and curriculum development teams may plan to rewrite a complete course, using the LINC system as a foundation on which to build their new content. For them the LINC program becomes a model and a source of objectives and questions to borrow from. Some institutions have patterned other courses, such as science and commercial subjects, on the LINC system.

As part of their training, instructors are taught a model of curriculum development which follows six basic steps or phases. They can then use whatever they need from the model to localize the program.

Phase 1: Define the terminal behaviors.
Phase 2: Design an evaluation system.
Phase 3: Define and cluster instructional objectives.
Phase 4: Prepare evaluation instruments.
Phase 5: Prepare learning activities.
Phase 6: Prepare individual student activities.

E. CONCLUSION

The LINC program exemplifies the principles and processes of individualization which many adult upgrading institutions in Canada are trying to implement. Use of the program encourages, and even forces, instructors to work at a one-to-one level with adult students. If instructors use the program conscientiously, even after they expand or adapt it, they automatically put the principles and processes into effect in the classroom. In this way the LINC program is a vehicle for innovation.

LINC was designed as a core program with syncretic capabilities; it can absorb the best features of any program or materials already in use in a school. Its built-in system of placement, diagnosis, prescription, individual work with a variety of materials and methods, and evaluation provides a framework for varying content and standards needed to fit a local situation.

Busy instructors may not have the time, ability, or inclination to develop a full program at once. However, by giving them a framework, a basic system complete and viable from the first day, they are relieved of much of the tedium of development, they have a model to follow, they can make changes and improvements gradually and they can be expected to conduct a very high level of relevant training in their classrooms.

CHAPTER V

COGNITIVE STYLES AND THEIR MAPPING FOR TRAINING AND DEVELOPMENT

Bikkar S. Randhawa*

Individual differences have provided a challenge both to researchers and practitioners. The unravelling of this challenge has already occupied psychologists and educators for a number of years. The mystery of individual differences and the various dimensions of their variability has intrigued social scientists. Though unequivocal resolution of the various dimensions of human variability is far from complete, several comprehensive models and theories have been proposed to illustrate the interactive effects of the various dimensions (e.g., Gardner, Jackson, and Missick, 1960; Guilford, 1967).

It is evident that a few early workers in the area of mental measurement had emphasized differences in sensory and perceptual characteristics. Galton (1883) developed measures of sensitivity to tones and weight discrimination, and also attempted to determine the forms of imagery of subjects. Cattell and Farrand (1896) and Gilbert (1897) are also among the early researchers who measured perceptual differences. Even before the turn of the century accurate measurements of differences in perception were available. But the interest in such research declined. The reason seems to be that research in individual differences has a practical orientation and tends to be continued only when some potential applications are evident (Tyler, 1965).

Costs of education, training, and development of materials have hit the all time high. Funding for these enterprises is coming under tough scrutiny and concern. The cost-benefit analyses do not present a bright picture for all concerned in our society. The disillusionment of educators, students, and administrators at the payoff of education is shared by the taxpayers. The study of cognitive styles and mapping for educational training and development holds promise for increased returns from educational investments.

---

*Professor, College of Education, University of Saskatchewan, Saskatoon

This paper is an attempt to review the related literature in the area of cognitive (learning) styles, cognitive mapping, correlates of cognitive styles, effects of cognitive styles on learning, changes in cognitive maps and their concomitant effects. In a separate section of this paper important training and development implications will be discussed.

Cognitive Style

Framework. Individual differences among students in a given situation have long been known and studied by psychologists and educators. A number of personality and cognitive, or intellective, factors that might explain the individual variations in any group of learners have been examined. Cognitive style is one of the most intriguing concepts studied in this area. However, application of a cognitive style approach to study of the classroom situation is in its beginning stages. Accordingly, for some of the practical implications to be discussed in this report direct evidence is quite sparse.

The concept of cognitive styles had its origin some twenty years ago in the observation of self-consistency in an individual's way of handling a wide range of perceptual and intellectual tasks. Hence, the designations "cognitive" and "style". Further research indicated that modes of functioning expressed in a given cognitive style could be found, in congruent form, in the individual's personality and social behavior as well. Despite much evidence that cognitive style dimensions are clearly quite broad in scope, the original label persists. Because of the inclusion of extra-cognitive components involved in it, a designation such as "personal styles" seems more appropriate (Witkin and Moore, 1974). Sigel and Coop (1974) certainly affirm the breadth in scope of this concept in stating that "cognitive style is an integrated concept in that its definition implicity bridges the personality - cognitive dimensions of the individual (p. 251)". Hill's (in an undated manuscript) use of the concept of cognitive style is similarly broad in scope. He states that "an individual's cognitive style is determined by the way he takes note of his total surroundings -- how he seeks meaning, how he becomes informed (Hill, p. 3)".

The concept of "learning style" certainly encompasses the broadened scope of the concept of cognitive style. For example, Nations (1967) perceived learning styles as a combination of sensory orientation, responsive mode, and thinking pattern. More details on learning styles will be provided later. Also a brief discussion on the structure of intellect will be incorporated in the section on learning styles.

Distinctive Styles. Cognitive style refers to self-consistent and enduring individual differences in perceiving, ideating, or presenting aspects of the environment requiring symbolic mediation. The term cognitive style refers, therefore, both to individual differences in general principles of cognitive organization (simplification and consistency trends), and to various self-consistent idiosyncratic tendencies (intolerance for ambiguity; memory for particular kinds of experience; preferences) that are not indicants of human cognitive behaviours in general. It represents differences in personality organization as well as in genetically and environmentally determined variations in cognitive capacity and functioning. It is also seen as a mediator between motivation and emotion, on the one hand, and cognition, on the other (Paul, 1959).

Ausubel (1968) listed several cognitive styles that have been identified and studied. These are intolerance for ambiguity (tendency toward premature closure); intolerance for unrealistic experience; leveling - sharpening; need for simplification (skeletonizing, rationalizing); degree of cognitive differentiation; explication and importing of detail in memory (embroidery); vividness of memory, long-term versus short-term memory; memory for particular kinds and sense modalities of experience; rigidity or flexibility in problem solving; preference for cognitive complexity or simplicity, for widely known or little known information; and preference for broad or narrow categorization. Other possible and suggested cognitive style constructs include strategy preferences in problem solving (scanning or focusing; the use of whole or part hypotheses); strategy preferences in acquiring, organizing, and processing information; memory for details or concepts; integration versus compartmentalization in memory; and degree of openness to new information after closure is achieved.

It must be emphasized that the term cognitive style has been used by a number of investigators to denote the different ways in which children and adults perceive and categorize their environment in specific situations in self-consistent and enduring manner. However, each investigator has a different meaning in mind when he defines his concept of cognitive style. The definition of cognitive style has mostly been dependent on the type of tasks that the researcher employed to elicit the responses on which the subjects were classified. Therefore, there is no doubt that there has been some confusion regarding the construct of cognitive style. It becomes essential, therefore, to mention the investigator as a context in which a style is used. It is hoped that an examination of some of the most frequently used measures of cognitive style will help to clarify this confusion. Some of the major style categories along with examples of the measuring tasks for categorization will be presented.

Major Style Categories. The domain of cognitive styles is vast. This section will confine discussion to cognitive style categories that grew out of the leadership and direction of Broverman, Gardner, Kagan, and Witkin.

a. Cognitive Style as Intraindividual Differences: Broverman (1960) conceptualizes cognitive styles as expressions of different "response probabilities or response strengths in certain types of classes of behaviours (p. 167)". His conception of cognitive style is somewhat different from any of the other researchers in the area.

He views cognitive style as relationships between the functions within individuals ... rather than ... individual differences which are based upon normative differences between individuals (Broverman, p. 487)".

It follows then that individuals have developed ways of responding to particular types of situations and that the chance of a particular response being used depends on the nature of the task and the intensity with which a particular response is held. Much of Broverman's recent research has been devoted to the delineation of two cognitive styles.

The first cognitive style is conceptual versus perceptual motor dominance. This refers to "specialization in novel or difficult perceptual-motor behaviours, or vice versa (Broverman, p. 487)". It has been demonstrated that a conceptual dominance is related to performance on sections of the Primary Mental Abilities test, nonsense syllable fluency tests, Stroop Word-Color test, Spelling Three Letter Anagrams test, and the Fifteen Clues test. However, performance on card sorting tasks, Primary Mental Abilities Spatial subtest and toothpick construction test are correlates of a perceptual-motor dominance.

The second cognitive style identified by Broverman is a strong versus weak automatization. This is determined on the basis of performance on automatic habitual type of situations (simple repetitive tasks). Strong automatization is associated with the ability to complete simple addition and subtraction problems, the ability to perform well on the Stroop Word-Color Interference test, and the ability to solve threee letter anagrams. However, weak automatization is correlated with a better performance on the Kohls Blocks, Porter's Maze, Goodenough Draw-A-Man test, Witkin's Embedded Figures test, Thurstone-Gothschaldt Figures test, and the Reasoning Subtest of the Primary Mental Abilities test.

Broverman's distinction between styles relative to task is rather interesting. It must be noted that other conceptual schemes of cognitive styles do not take the task into account. Broverman proposes a functional relationship between style responses and types of task. It is very relevant and practical for educational applications.

b. Cognitive Control Principles: Cognitive controls are the result of work of Gardner and his colleagues (Gardner, Holzman, Klein, Linton, and Spence, 1959; Gardner, Jackson, and Messick, 1960). Cognitive controls are the pervasive organizing principles that guide behavior toward a goal. Gardner and his associates perceive cognitive style from a psychoanalytic framework. Their notion of cognitive style incorporates a number of different principles all of which function to assist the individual in adapting to a complex environment.

Gardner and his co-workers have identified six control principles which in their totality describe an individual's style. These control principles are sharpening - leveling, equivalence range, scanning (focal attention), tolerance for unrealistic experience, flexible - constricted, and field articulation (field independence - field dependence). It is interesting to observe that at the beginning these workers used the term "perceptual attitude" or its German equivalent *Anschauung* as a label for these personal ways of understanding reality. However, it was realized that other cognitive processes besides perception were involved and *cognitive control principles* seemed to be a more accurate label.

The *sharpening* - *leveling* dimension was the first of these control principles that was intensively studied. Sharpeners differ from levelers in the degree of articulation of recall. When an individual experiences a series of similar stimuli, each new stimulus affects the memory of the preceding stimuli. The interaction of the perceptual processes and memory traces is called mutual assimilation. Sharpeners are less susceptible to the influence of mutual assimilation whereas levelers are relatively more susceptible to such influences. The Schematizing test developed by Hollingsworth is used most often to differentiate sharpeners and levelers. This test involves the presentation of squares one at a time in random order in sets of five different sizes and the subject is required to judge the size of each. The levelers show significantly greater inaccuracy in their size judgments than the sharpeners. The theoretical distinction between levelers and sharpeners is that levelers tend to assimilate new stimuli to an already dominant cognitive organization and thus not to be aware of differences between the new and the old, whereas sharpeners notice changes and keep successive stimulating situations distinct from one another.

The second cognitive control variable is *equivalence range*. This is usually measured by an object-sorting test in which a subject is free to use as many or as few categories as he wishes. Individual differences in this variable are self-consistent and endurable.

Another cognitive control principle is *scanning* (focusing). The test used to measure it is usally a size estimation task of some sort and the subject is required to match a variable stimulus to a standard. Individuals who focus on the standard tend to overestimate its size and those who scan the whole situation more broadly show much less overestimation.

The fourth cognitive control principle is referred to as *tolerance for unrealistic experience*. Tolerance for unrealistic experience "involves individual differences in willingness to experience, or to produce, organizations of stimuli at variance with what the subject 'knows' to be true in a relatively literal and conventional sense (Gardner and Moriarty, 1968, p. 50)". It can be measured by an apparent movement test in which the alternation rate of the stimuli can be controlled. The score used to measure this principle is the range of alternation rates over which the illusion of movement occurs.

The fifth cognitive control principle is called *flexible versus constricted control*. Much less supplementary evidence is available on this variable than the previous ones. It is measured by the Color-Word test, in which after reading the names of colors, and naming actual colors presented in stimulus strips, the individual is presented with color names painted in conflicting colors and asked to name each color, ignoring the word. In the study of individuals, four consistencies referred to above this control variable did not seem to define a separate factor (Gardner, et al, 1959). Therefore, the status of this control principle as a separate variable is a bit doubtful.

The sixth control principle emerged from the evidence of separate existence of Witkin's field independence - dependence dimension. However, Gardner and his colleagues preferred to call it field articulation. This principle will be discussed later in the section on field independence-dependence style.

c. Kagan's Stylistic Modes: Kagan, Moss, and Sigel (1963) define cognitive style as a "term that refers to stable individual preferences in mode of perceptual organization and conceptual categorization of the external environment (p. 74)". They describe analytic - descriptive, inferential-categorical, and relational-contextual tendencies among subjects in grouping pictures. These tendencies of perceiving and categorizing are based on individuals' responses to pictorial stimuli, Conceptual Style Test.

An analytic - descriptive response reflects the tendency to classify items on the basis of objective, observable characteristics that are part of the total stimulus situation. This response mode is typically characterized by a splitting of the stimulus situation into component parts and attending to these discrete pieces as a basis for categorizing the total stimulus.

The inferential - categorical response mode (style) is exemplified by an individual who chooses to form his categories on the basis of inferences made about the pictures he groups together. No unitary objective characteristic is partialled out by the individual as the basis of classification.

A relational - contextual style is manifest when pictorial items are grouped together on the basis of temporal, functional, or spatial contiguity. It has been observed that several times these responses reflect a certain theme or story line that integrates the various items characterized in a relational manner.

As Kagan pursued his work with the three dimensions of cognitive style discussed above, he observed that many subjects tended to take a long time to reflect over various stimulus alternatives before making a response, and other individuals tended to give a very quick response to the tasks presented them. Kagan was impressed by the difference in response uncertainty (i.e., two or more highly plausible response alternatives). He developed a test called the Matching Familiar Figures Test (MFF) to determine response time and errors made by the subjects. Based on this test Kagan proposed a new cognitive style called conceptual tempo.

Conceptual tempo reflects the speed with which an individual responds to tasks of high response uncertainty and the number of errors made in the responses. Those subjects who respond fast and make many errors are called *impulsive*. However, those respondees who are slower in responding and make fewer errors are called *reflective*. It has been observed that generally subjects with *analytic* - descriptive style of responses on the Conceptual Style Test tend to be reflective.

d. *Field - Dependence - Independence Cognitive Style*: Field - dependence - independence dimension of cognitive style is based on a *global-analytic*-continuum. "Relatively field-independent persons tend to experience parts of the field as discrete from the surrounding field, even when the field is so organized as to strongly embed the part; that is, they perceive analytically. Perception of relatively field-dependent persons, on the other hand, is guided by the organization of the field as a whole, so that any part of the field is experienced as continuous with its surrounding; that is, their perception is global (Witkin and Moore, 1974, p. 2)". Witkin's Embedded Figures Test is used to identify field-independent and -dependent subjects. This test attempts to determine the extent to which individuals are able to overcome the effects of distracting background elements (the field) when they are attempting to differentiate relevant aspects of a particular situation. This cognitive style concept is very thoroughly discussed in *Personality Through Perception* (Witkin, et al, 1954) and Psychological Differentiation (Witkin, et al, 1962). There is perhaps more research evidence on this style than any other cognitive style identified thus far. However, very active research work is being pursued in conceptual tempo and evidence on this style is very rapidly accumulating. It must be noted that analytic style described by Kagan, et al (1963) is quite different from the description given this term by Witkin et al (1954). Empirical evidence substantiates the distinctiveness of the two styles described by these two schools of thought (Coop and Hovenden, 1967; Frehner, 1971).

Review of Research. Many interesting relationships have emerged from research involving the various notions of cognitive style. There is not enough research evidence that bears directly on *practical* educational problems such as match-mismatch of cognitive styles in learners and instructors and its consequent interactive effects on dependent variables. Only a start has been made in this direction and much more needs to be done. Witkin and Moore (1974) point out a number of fruitful research avenues that can be pursued to tackle some of the crucial educational issues.

Review of research in this section will be limited to only those relationships that have educational (curriculum and training) implications. However, for a review of the many results that deal with theoretical and methodological matters, see Kagan and Kogan (1970).

Witkin and Moore (1974) argue that "field dependent" and "field independent" are labels for clusters of characteristics, both cognitive and personal, justifying the designation "personal styles". Two comprehensive reviews on Witkin's notion of personal styles and their relationships with educationally relevant variables are very significant sources for researchers (Witkin, 1973; Witkin and Moore, 1974). Only conclusions from these two sources will be provided in this section.

"It is now well documented that relatively field-dependent persons are drawn to people, both in the sense of being interested in what others say, do and feel, and in the sense of liking to have people around them (Witkin and Moore, 1974, p. 3)". The field-dependent people have been found to favor occupations which require involvement with others -- for example, selling, elementary school teaching, rehabilitation counselling. Preferences of field-independent persons are found to be for those occupations in which working with others is not especially important -- for example, astronomy, engineering. Field-dependent persons prefer academic subjects in the social sciences when in school whereas field-independent persons tend to favor mathematics and the physical sciences (Witkin, 1973).

Field-dependent persons have been found to be particularly responsive to nuances of emotional expression in people around them. Also these persons tend to take greater account of external social referents in defining their own points of view and feelings (Witkin and Moore, 1974). What are the implications of these distinctive social-orientations of field-dependent and field-independent persons for how they learn and what they learn?

"Field-dependent and field-independent persons are not different in sheer learning ability or memory. However, reflecting differences between them in interests, and hence in what is attended to, salient and relevant, field-dependents are better at learning and remembering social material and field-independents are better at learning and remembering impersonal material (Witkin and Moore, 1974, p. 6)". It can be concluded from the above discussion that field-dependents and field-independents cannot be arrayed along a better-worse continuum on learning tasks. Each could be expected to do better at tasks requiring matching basic orientation.

Witkin and Moore (1974) have, on the basis of a sizeable literature, stated the effect of social reinforcement, "one of the handiest tools in the teacher's armamentarium of devices for perpetuating some student behaviours and obliterating others," on persons with field-dependent and field-independent orientations. They conclude that social reinforcement has a significantly decisive effect on field-dependents and field-independents. However, the effect of response-contingent reinforcement is differential on persons with these two orientations. The results of studies of Ferrell (1971) and Fitz (1970) indicate, by and large, that negative reinforcement, administered immediately after a response is made, has greater effect, in the form of better learning, on field-dependent than field-independent persons. Positive reinforcement following a response seems to have little effect on either kind of learner.

The organizational nature of the learning material again has differential effect on field-dependent and field-independent learners. Whatever the nature of the material field-dependent learners are required to learn, they are more likely to take its organization as given, rather than attempt to impose an organization of their own. Witkin and Moore (1974) further state that often in learning, the material to be learned lacks clear inherent structure, creating thereby the need that learners themselves provide organization as an aid to learning. Field-dependent learners are found to have more difficulty in learning such material as compared with field-independent learners. For the well organized material requiring no further structuring, field-independent and field-dependent learners are not likely to differ in their learning of it (Bruce, 1965).

Since field-independents are better able to organize their experience it is postulated that they may be better able to provide their own strategies for coding and utilizing information and are less reliant on strategies that may be provided by the task or by someone else. Koran, Snow, and McDonald (1971) investigated individual differences in the acquisition of a teaching skill from written and video-modeling procedures. They found that these two treatments were differentially effective for learners of different orientations. Video-modeling was more effective in general but field-dependent teachers benefited equally or more from the written modeling.

For training, instruction, or therapy, the question to be answered is this: What are the effects of an interaction when its participants are matched or mismatched on cognitive style? DiStefano (1969) investigated interpersonal perceptions of teachers and students in regular classroom situations. He found that teachers and students matched to each other in style perceived one another positively, whereas students and teachers who were mismatched perceived each other negatively. It is interesting to note that the positive and negative evaluations included not only personal characteristics but intellectual characteristics as well. In a recent study, James (1973), using a specially created mini-course confirmed DiStefano's results. Similar results in feelings of patients toward their therapists in matched and mismatched dyads were obtained by Folman (1973) and Greene (1972).

In summary, research involving field-independent and field-dependent styles has indicated that field-independent persons tend to be analytic in intellectual approach, somewhat distant from others, high achievers, emotionally independent, and active and controlling their environments rather than being controlled by them. Field-dependent persons are found to be the opposite of field-independent persons in the variables listed above.

The variables summarized above in connection with Witkin's notion of cognitive style have also been studied by Kagan and others (Kagan, Moss, and Sigel, 1963; Kagan, Rosman, Day, Albert, and Phillips, 1964; Sigel, 1963; Broverman, 1960). Kagan, et al descriptive-analytic styles are also related to personality, social, and intellectual characteristics. Most of the reported research for these styles involved children. Only a few studies are known to have used adults.

Kagan, et al (1963, 1964) found sex differences on analytic-descriptive and relational-contextual styles. Boys employed more analytic-descriptive whereas girls employed more relational-contextual responses. Analytic-descriptive responses were related to nonverbal intelligence tests, learning of concepts, and memory for details. Also analytic responses of males were related to cautiousness, learning skills, achievement orientation, independence and activity. The reverse held true for girls on most variables.

Kagan and Kogan (1970) reported that reflective-impulsive style was consistent across situations. It was also reported that reflectives made fewer errors than impulsives in recall, reading, and reasoning. Persons high on inferential-categorical responses were found to be also high on the Binet intelligence test. These results were interpreted as an indication that inferential-categorical style may well be a product of conventional socialization experiences (Sigel, Jarman, and Hanesian, 1967).

Serafica and Sigel (1970) found that inferential-categorical style identified good and poor readers. The readers tended to yield more inferential-categorical responses than did the nonreaders. The authors interpreted this result as suggestive of the importance of the role of interpretive-conceptual processes in reading, as compared to the emphasis on discrimination of particular details.

Cognitive Maps

E.C. Tolman published a paper in Psychological Review (1948) entitled "Cognitive Maps in Rats and Men". Tolman presented in this paper a description of various learning experiments with rats and suggested in the conclusion of it the implications of his rat work for the purposive behaviour of men. He admitted his affiliation with field theorists and asserted that "we believe that in the course of learning something like a field map of the environment gets established in the rat's brain (Tolman, 1948, p. 192)". The theoretical position Tolman took in the above paper contained two assumptions. "First, that learning consists not in stimulus-response connections but in the building up in the nervous system of sets which function like cognitive maps and second, that such cognitive maps may be usefully characterized as varying from a narrow strip variety to a broader comprehensive variety (p. 193)".

Tolman (1932, 1959) listed four main kinds of individual difference variables which are relevant for the purposes of this paper. The four are heredity, age, training, and endocrine, drug, or vitamin conditions. Using the initial letters of these four, Tolman called them the HATE variables. As can be noted, only one of the HATE variables involves learning. Individual differences through learning (training) could also be inferred from the cognitive maps of learners (from the broad comprehensive to the narrow strip map continuum). However, Tolman (1948) suggested that "narrow strip maps rather than broad comprehensive maps seem to be induced: (1) by a damaged brain, (2) by an inadequate array of environmentally presented cues, (3) by an overdose of repetitions on the original trained-on path, and (4) by the presence of too strongly motivational or of too strongly frustrating conditions (pp. 205-207)". These conditions should be of paramount value when taken into account in child rearing and directing the learning of individuals in institutions or clinical settings.

Now operationally defined a cognitive map is a picture of the diverse ways in which an organism acquires meaning. It identifies his cognitive strengths and weaknesses. This information can be used to build an individualized and personalized program of instruction or training (Hill, undated manuscript). Hill provides an illustration of a personalized program of instruction through cognitive mapping in a series of publications under the general heading "The Educational Sciences".

It must be emphasized that a cognitive map is simply an inferred description of the cognitive traits of an individual. Though theoretically we expect an infinite number of distinctive cognitive traits in the population at large, yet grouping and reducing the dimensions of variability in cognitive patterns a manageable number of maps for instructional prescription can be obtained. However, research with match-mismatch of learner cognitive map with the intended instructional strategy is only its infancy. Once again we are in a situation where theory is far ahead of its implementation and the associated research. A learning style is essentially a cognitive map of the learner. In other words, Witkin's (1974) suggestion to refer to cognitive styles as personal styles is in essence broadening the scope of cognitive styles as we have known them till now. Thus the broadened scope of cognitive styles would more appropriately be referred to as learning styles.

The Structure of Intellect

A morphological model of intelligence was first proposed by Guilford in 1956. In astronomy, similar analysis was applied by Zwicky (1957). Guilford's (1956, 159, 1967) model of intelligence attempts to cross-classify abilities in three different ways, and the categories of one dimension of ability intersect with abilities of the other two dimensions. A graphic representation of the structure of intellect model is given in Figure 1.

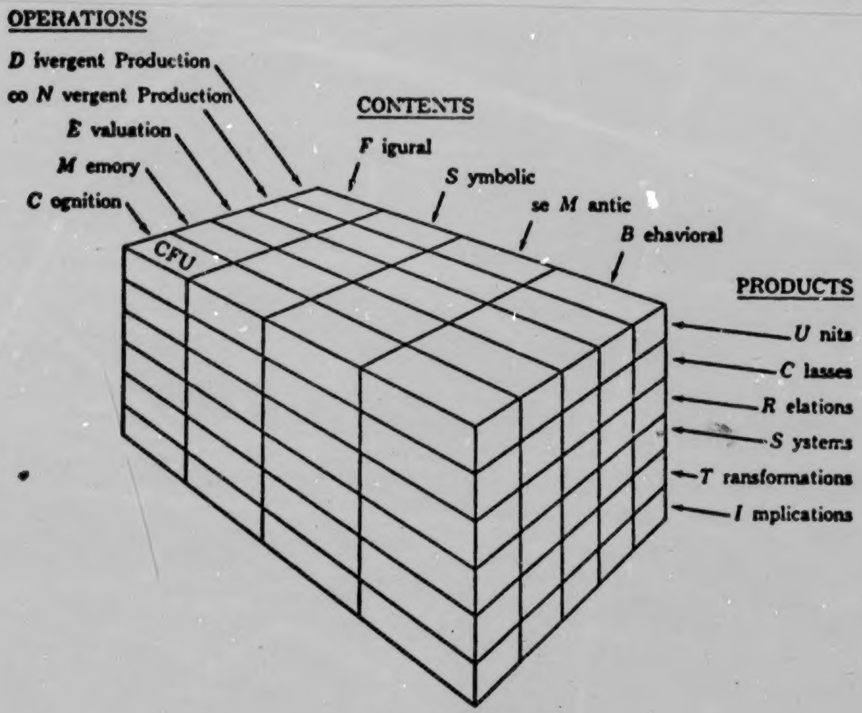

OPERATIONS
D ivergent Production
co N vergent Production
E valuation
M emory
C ognition
CONTENTS
F igural
S ymbolic
se M antic
B ehavioral
PRODUCTS
U nits
C lasses
R elations
S ystems
T ransformations
I mplications
CFU

Figure 1. STRUCTURE OF INTELLECT CUBE

One way of classification is in terms of the kind of mental operation involved in the abilities. An operation is a major intellectual activity or process; things the organism does with the raw materials of information. Information in this context is "that which the organism discriminates". Each ability involves simply one of the five operations outlined in Figure 1. Each operation category is depicted as encompassing 24 different abilities which are parallel to those in every other operation category.

The second way of classification is in terms of content. Contents are broad, substantive, basic kinds or areas of information within which the operations are performed. Each of the four content categories includes 30 abilities that are parallel to those in every other content category (see Figure 1).

The third dimension of classification of abilities is in terms of product. "Whereas we may say that the content categories describe the basic substantive kinds of information from the psychological point of view, the product categories describe the formal kinds of information (Guilford and Hoepfner, 1971, p. 18)". There are six product categories as shown in Figure 1. Each product category contains a set of 20 abilities which are parallel to those in every other product category. Products are "basic forms that information takes in the organism's processing of it (Guilford and Hoepfner, 1971, p. 21)".

All three classifications (operations - 5, contents - 4, and products - 6) put together in one cross-classification produces the model illustrated in Figure 1. There are a total of 120 little cubes (5 x 4 x 6) or cells in the model. Each little cell in the model represents theoretically a unique kind of ability by virtue of its unique combination of one kind of operation, one kind of content, and one kind of product. For example, it may be the cognition of figural units (CFU), the memory of symbolic relations (MSR), or the evaluation of behavioural classes (EBC).

It must not be assumed that 120 abilities cover the entire range of intellective traits or variables. With thorough investigations there are reasons to expect more than the number postulated in the structure of intellect. Evidence has been found that at least three of the cells already have two abilities represented in each of them (Guilford and Hoepfner, 1971). The cognition of figural units (CFU), the cognition of symbolic units (CSU), and the memory for figural systems (MFS) cells have visual and auditory abilities. The cell for cognition of figural systems has not only a visual and an auditory ability but also appears to have a kinesthetic ability. It it likely that within the cognition and memory operation categories, at least, there may be quite generally differentiation of abilities along sense-modalities. This may also prove to be the case in other operation categories for figural and symbolic categories of content. Future research in these areas may determine the existence of sense modalities as a new dimension for a complete model of intelligence.

It must not also be assumed that, "although the abilities are separate and distinct logically and they can be segregated by factor analysis, they function in isolation in the mental activities of the individual. Two or more abilities are involved in solving the same problem (Guilford and Hoepfner, 1971, p. 19)".

Major Dimensions and Subcategories. Major dimensions and their categories are defined below. Examples of abilities representing the categories along with other elaborations are also given. The codes used to represent these categories are given in the parentheses following the category name. These codes are also evident in Figure 1 from the capital letters used in the designations of the categories. Each structure of intellect ability is generally designated in terms of its special trigram which is composed of a letter from each of its dimensions -- its operation, content, and product, in that order. For example, CSU is an abbreviation for "cognition of symbolic units" and EMS represents "evaluation of semantic systems". A unique definition can be obtained for each cell, ability, by simply specifying its characteristics in terms of the represented categories from the three major dimensions.

Operations. Major kinds of intellectual activities or processes; things that the organism does in the processing of information, information being defined as "that which the organism discriminates".

Cognition (C): Immediate discovery, awareness, rediscovery, or recognition of information in its various forms; comprehension or understanding.

Memory (M): Fixation of newly gained information in storage. The operation of memory is to be distinguished from the memory store.

Divergent production (D): Generation of logical alternatives from given information, where the emphasis is upon variety, quantity, and relevance of output from the same source. Likely to involve transfer recall (instigated by new cues).

Convergent production (N): Generation of logical conclusions from given information, where emphasis is upon achieving unique or conventionally best outcomes. It is likely that the given (cue) information fully determines the outcome, as in mathematics and logic.

Evaluation (E): Comparison of items of information in terms of variables and making judgments concerning criterion satisfaction (correctness, identity, consistency, etc.).

Contents. Broad, substantive, basic kinds or areas of information.

Figural (F): Pertaining to information in concrete form, as perceived or as recalled in the form of images. The term "figural" minimally implies figure-ground perceptual organization. Different sense modalities may be involved

-- visual, auditory, kinesthetic, and perhaps others.

Symbolic (S): Pertaining to information in the form of denotative signs having no significance in and of themselves, such as letters, numbers, musical notations, codes, and words (as ordered letter combinations).

Semantic (M): Pertaining to information in the form of conceptions or mental constructs to which words are often applied, hence most notable in verbal thinking and verbal communication, but not necessarily dependent upon words. Meaningful pictures also convey semantic information.

Behavioural (B): Pertaining to information, essentially nonfigural and nonverbal, involved in human interactions, where the attitudes, needs, desires, moods, intentions, perceptions, thoughts, etc. of others and of ourselves are involved.

Products. Basic forms that information takes in the organism's processing of it.

Units (U): Relatively segregated or circumscribed items or "chunks" of information having "thing" character. May be close to Gestalt psychology's "figure on a ground".

Classes (C): Conceptions underlying sets of items of information grouped by virtue of their common properties.

Relations (R): Connections between items of information based upon variables or points of contact that apply to them. Relational connections are more definable than implicational connections.

Systems (S): Organized or structured aggregates of items of information; complexes of interrelated or interacting parts.

Transformations (T): Changes of various kinds (redefinitions, shifts, transitions, or modifications) in existing information.

Implications (I): Circumstantial connections between items of information, as by virtue of contiguity, or any condition that promotes "belongingness".

Learning Styles and Multiple-Ability Conception of Intelligence. It has been pointed out earlier that learning styles are the cognitive maps -- the various ways learners derive meaning from the environment.

Tolman (1948) asserted that in the course of learning something like a field map of the environment gets established. In other words, learning produces intellectual development of various kinds. The structure of intellect (SI) model provides a basis of determining how an individual acquires meaning. This model holds potential for assessing 120 distinctive abilities, though all of the 120 SI abilities are not demonstrated as yet. About 100 SI abilities that have already been demonstrated offer an optimistic note for all those interested in individual differences. We can no longer be satisfied with the notion that intelligence is a simplicity which can be singularly expressed quantitatively.

The SI model and the research associated with the explication of it provide not only a means to express intelligence as multiple abilities but also provide the means to train and foster intellectual development. The SI profiles offer parameters for material to train abilities. They also offer a basis for individualized teaching (Meeker, 1969). It would appear that the SI model may be considered as a comprehensive mechanism in which the learning styles are embedded.

Research and Practical Issues. Guilford (1967) and Guilford and Hoepfner (1971) provide theoretical and technical details on the SI abilities. The latter work reported that 98 of the 120 SI abilities had been demonstrated. These abilities represented by the trigrams are presented in Table 1. It is clear from this table that all of the abilities (cells) in the behavioral content except cognition and divergent production have yet not been demonstrated. Meeker (1969) reported that about 79 abilities were demonstrated. She provides an excellent coverage of about 79 abilities with practical suggestions for curriculum, instruction, and remediation of deficits in these abilities.

It is interesting to note that Guilford and his associates admit the effect of training on intelligence. Another jolt is thereby administered to the geneticist position. Guilford (1967) stated that "if we grant that one of the major objectives of education is to foster intellectual growth of individuals, the new information regarding the nature of intelligence should not only contribute to the philosophy of education by helping to refine that objective but also provide suggestions for implementing it. It is now better known what intellectual development means (p. 475)".

Myers and Torrance (1964) have designed and published formal exercises suitable for training school children in intellectual skills. Materials for college students was developed and used by Upton and Samson (1963) and Parnes (1961) developed materials for adults in general for training in intellectual skills.

Teaching methods and techniques as well as examinations can be significantly guided on the basis of the SI model. The way in which a subject is presented may make all the difference in the world as to which abilities are emphasized. The nature of the examinations used largely determine the kind of preparation students do in order to do well on them. Specific techniques of presentation of material to be learned and the kind of examinations to be used to determine the extent of that learning can be suggested by the nature of the SI abilities and the tests designed to measure them.

Another practical implication of the SI model is "that each person may be rather uneven in his many aspects of intelligence (Guilford, 1958, p. 28)". The common measures of ability often conceal such strengths and weaknesses in intellectual functioning. A person can often cover a weakness by having other strengths. However, some weaknesses may not be easily compensated. Thus it is not uncommon to find intelligent non-readers, non-spellers, non-writers, etc. The SI abilities could provide a clearer diagnosis of particular strengths and weaknesses in terms of the relevant factors.

Implications of the SI model should be obvious for educational and vocational guidance and counselling. When advising a client to pursue the direction of his strengths and to avoid the direction of his weaknesses, those stronger and weaker aspects must be known as clearly as possible. Much more analytic information than is provided by an IQ or even a half-dozen different scores is required. The multiple-ability conception of intelligence provides the user with this potential.

Table 1

Structure Of Intellect Factors That Have Been Demonstrated

Operation Categories	Content Categories				
	Figural	Symbolic	Semantic	Behavioral	Number Known
Cognition	CFU	CSU	CMU	CBU	24
	CFC	CSC	CMC	CBC	
	CFR	CSR	CMR	CBR	
	CFS	CSS	CMS	CBS	
	CFT	CST	CMT	CBT	
	CFI	CSI	CMI	CBI	
Memory	MFU	MSU	MMU	-	18
	MFC	MSC	MMC	-	
	MFR	MSR	MMR	-	
	MFS	MSS	MMS	-	
	MFT	MST	MMT	-	
	MFI	MSI	MMI	-	
Divergent production	DFU	DSU	DMU	DBU	23
	DFC	DSC	DMC	DBC	
	-	DSR	DMR	DBR	
	DFS	DSS	DMS	DBS	
	DFT	DST	DMT	DBT	
	DFI	DSI	DMI	DBI	
Convergent production	-	-	NMU	-	15
	NFC	NSC	NMC	-	
	NFR	NSR	NMR	-	
	-	NSS	NMS	-	
	NFT	NST	NMT	-	
	NFI	NSI	NMI	-	
Evaluation	EFU	ESU	EMU	-	18
	EFC	ESC	EMC	-	
	EFR	ESR	EMR	-	
	EFS	ESS	EMS	-	
	EFT	EST	EMT	-	
	EFI	ESI	EMI	-	
Number known	27	29	30	12	98

REFERENCES

AUSUBEL, D.P. *Educational Psychology: A Cognitive View*. New York: Holt, 1968.

BROVERMAN, D.M. Dimensions of cognitive style. *Journal of Personality*, 1960, *28*, 167-185.

BROVERMAN, D.M. Generality and behavior correlates of cognitive style. *Journal of Consulting Psychology*, 1964, *28*(6), 487-500.

BRUCE, D.K. The effects of field dependence and anxiety on the perception of social stimuli. (Unpublished doctoral dissertation, University of Utah). Ann Arbor, Michigan: University Microfilms, 1965, No. 65-12, 544.

CATTELL, J.M., and Farrand, L. Physical and mental measurements of the students of Columbia University. *Psychological Review*, 1896, *3*, 618-648.

COOP, R.H. and Hovenden, W.E. A correlational study of the analytic dimension of cognitive style. Unpublished paper, Indiana University, 1967.

DiSTEFANO, J.J. Interpersonal perceptions of field-independent and field-dependent teachers and students. Unpublished doctoral dissertation, Cornell University, 1969.

FERRELL, J.G. The differential performance of lower class, preschool, Negro children as a function of the sex of E, sex of S, reinforcement condition, and level of field-dependence. (Unpublished doctoral dissertation, University of Southern Mississippi). Ann Arbor, Michigan: University Microfilms, 1971, No. 71-28, 831.

FITZ, R.J. The differential effects of praise and censure on social learning as dependent on locus of control and field-dependency. (Unpublished doctoral dissertation, Catholic University of America). Ann Arbor, Michigan: University Microfilms, 1970, No. 71-1457.

FOLMAN, R.Z. Therapist-patient perceptual style, interpersonal attraction, initial interview behavior, and premature termination. (Unpublished doctoral dissertation, Boston University). Ann Arbor, Michigan: University Microfilms, 1973, No. 73-23, 482.

FREHNER, V. Cognitive style as a determinant of educational achievement among sixth grade elementary school students. Unpublished doctoral dissertation, Utah State University, 1971.

GALTON, F. *Inquiries into Human Faculty and Its Development*. London: MacMillan, 1883.

GARDNER, R.W., Holzman, P.S., Klein, G.S., Linton, H., and Spence, D.P. Cognitive control: A study of individual consistencies in cognitive behavior. *Psychological Issues*, 1959, *1*(4), (Whole No. 4).

GARDNER, R.W., Jackson, D.N., and Messick, S.J. Personality organization in cognitive controls and intellectual abilities. *Psychological Issues*, 1960, *2*(4), (Whole No. 8).

GARDNER, R.W., and Moriarity, A. *Personality Development At Pre-Adolescence*. Seattle: University of Washington Press, 1968.

GILBERT, J.A. Researches upon children and college students. *Iowa University Studies in Psychology*, 1897, *1*, 1-39.

GREENE, M.A. Client perception of the relationship as a function of worker-client cognitive styles. Unpublished doctoral dissertation, Columbia University, 1972.

GUILFORD, J.P. The structure of intellect. *Psychological Bulletin*, 1956, *53*, 267-293.

GUILFORD, J.P. New frontiers of testing in the discovery and development of human talent. In *Seventh Annual Western Regional Conference on Testing Problems*. Los Angeles: Educational Testing Service, 1958, pp. 20-32.

GUILFORD, J.P. Three faces of intellect. *American Psychologist*, 1959, *14*, 469-479.

GUILFORD, J.P. *The Nature of Human Intelligence*. New York: McGraw-Hill, 1967.

GUILFORD, J.P., and Hoepfner, R. *The Analysis of Intelligence*. New York; McGraw-Hill, 1971.

HILL, J.E. The educational sciences. Unpublished manuscript. Oakland Community College, Michigan. (Undated).

JAMES, C.D.R. A cognitive style approach to teacher-pupil interaction and the academic performance of black children. Unpublished Master's thesis, Rutgers University, 1973.

KAGAN, J., Kogan, N. Individual variation in cognitive processes. In P. Mussen (ed.), *Carmichael's Manual of Child Psychology*. New York: Wiley, 1970.

KAGAN, J., Moss, H.A., and Sigel, I.E. Psychological significance of styles of conceptualization. *Monographs of the Society for Research in Child Development*, 1963, *28*(2), (Whole No. 86), 73-112.

KAGAN, J., Rosman, B.Z., Day, D., Albert, J., and Phillips, W. Information processing in the child: Significance of analytic and reflective attitudes. Psychological Monographs, 1964, 78(1), (Whole No. 578).

KORAN, M.L., Snow, R.E., and McDonald, F.J. Teacher aptitude and observational learning of a teaching skill. Journal of Educational Psychology, 1971, 62, 219-228

MEEKER, M.N. The Structure of Intellect: Its Interpretation and Uses. Columbus, Ohio: Charles E. Merrill, 1969.

MYERS, R.E., and Torrance, E.P. Invitations to Thinking and Doing. Boston: Ginn, 1964.

NATIONS, J.E. Caring for individual differences in reading through nongrading. Unpublished manuscript from Seattle, Washington, Teachers, May 3, 1967.

PARNES, S.J. Student Workbook for Creative Problem-Solving Courses and Institutes. Buffalo, New York: University of Buffalo, 1961.

PAUL, I.H. Studies in remembering. The reproduction of connected and extended verbal material. Psychological Issues, 1959, 1(2), (Whole No. 2).

SERAFICA, F.C., and Sigel, I.E. Styles of categorization and reading disability. Journal of Reading Behavior, 1970, 2, 105-115.

SIGEL, I.E. How intelligence tests limit understanding of intelligence. Merrill-Palmer Quarterly, 1963, 9, 39-56.

SIGEL, I.E., and Coop, R.H. Cognitive style and classroom practice. In R.H. Coop and K. White (Eds.), Psychological Concepts in the Classroom. New York: Harper and Row, 1974. Pp. 250-275.

SIGEL, I.E., Jarman, P.D., and Hanesian, H. Styles of categorization and their intellectual and personality correlates in young children. Human Development, 1967, 10, 1-17.

TOLMAN, E.C. Purposive Behavior in Animals and Men. New York: D. Appleton-Century, 1932.

TOLMAN, E.C. Cognitive maps in rats and man. Psychological Review, 1948, 55, 189-208.

TOLMAN, E.C. Principles of purposive behavior. In S. Koch (Ed.), Psychology: A Study of Science. Vol. 2. General Systematic Formulations, Learning, and Special Processes. New York: McGraw-Hill, 1959. Pp. 92-157.

TYLER, L.E. The Psychology of Human Differences. New York: Appleton-Century-Crofts, 1965.

UPTON, A., and Samson, R.W. *Creative Analysis*. New York: Dutton, 1963.

WITKIN, H.A. The role of cognitive style in academic performance and in teacher-student relations. Educational Testing Service, Research Bulletin, 1973, 11.

WITKIN, H.A., Dyk, R.B., Faterson, H.F., Goodenough, D.R., and Karp, S.A. *Psychological Differentiation: Studies of Development*. New York: Wiley, 1962.

WITKIN, H.A., Lewis, H.B., Hertzman, M., Machoner, K., Meissner, P.B., and Wapner, S. *Personality Through Perception: An Experimental and Clinical Study*. New York: Harper and Brothers, 1954.

WITKIN, H.A., and Moore, C.A. Cognitive style and the teaching learning process. Paper presented at the annual meeting of the American Educational Research Association, Chicago, April 15-20, 1974.

ZWICKY, F. *Morphological Analysis*. Berlin: Springer, 1957.

CHAPTER VI

COURSE DEVELOPMENT FROM THE DEVELOPER'S VIEWPOINT

Naida Waite*

A BTSD program may be open in the sense that anyone is eligible to enroll. This implies that adults will enter with many different backgrounds of experience, and many different levels and combinations of academic achievement, and that their instruction will need to be individualized.

The program may be open in the sense that the learning will not be done in a formal classroom on a set schedule. In order to avoid over-dependence on reading and to achieve certain objectives, it may be advisable to introduce oral materials, pictures (still or moving), manipulative materials, or other media, in various combinations.

In this way the student will have the advantage of spoken instructions, explanations, practice sequences, drills, examples, models, oral tests, pictorial illustrations, motion-picture demonstrations of processes, and so on, at the time when he needs them. He can repeat these dynamic sequences until his learning needs have been met.

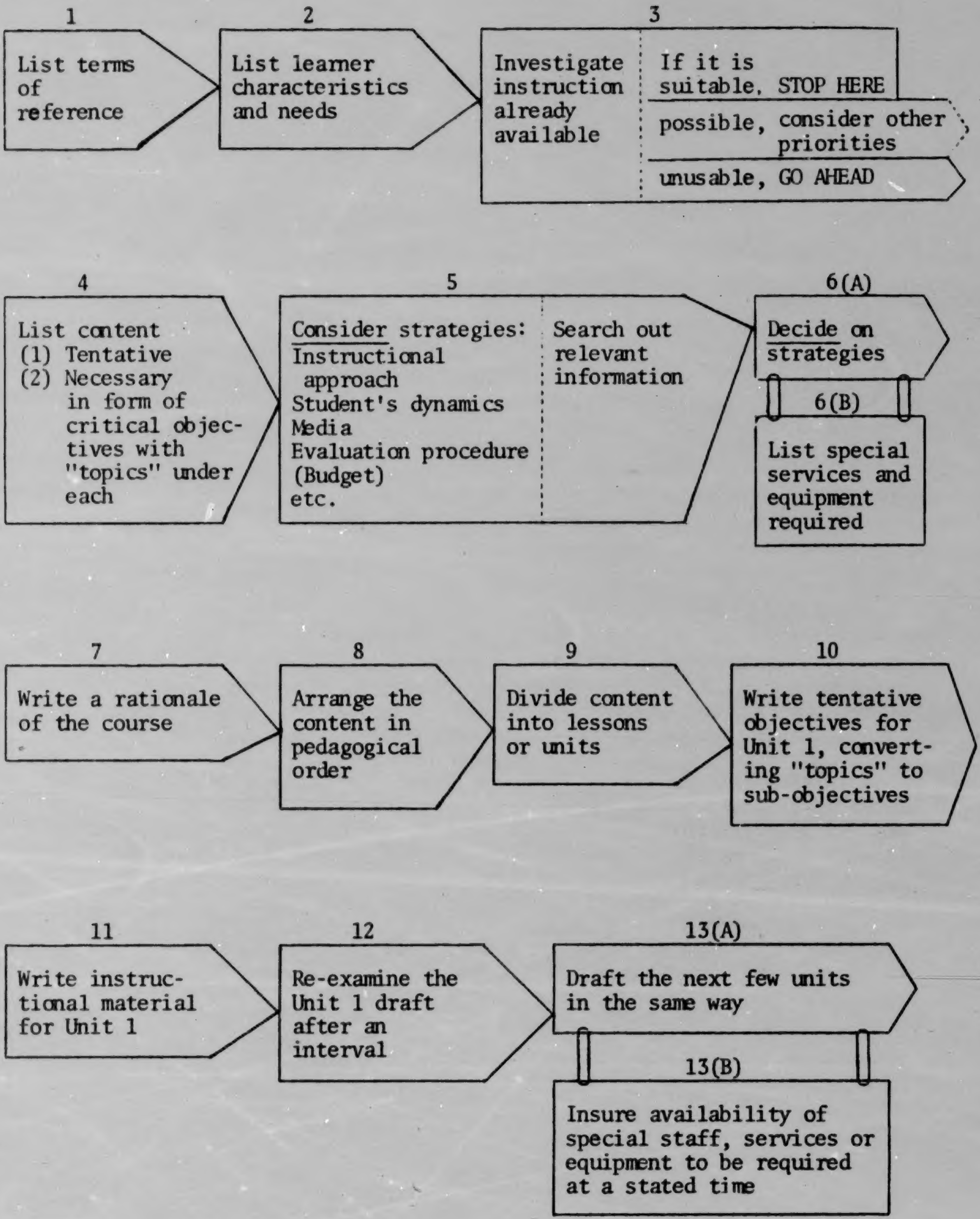
Within the general topic of open training programs, this paper will deal with the process of developing a complete individualized training course which includes the use of media in addition to printed books.

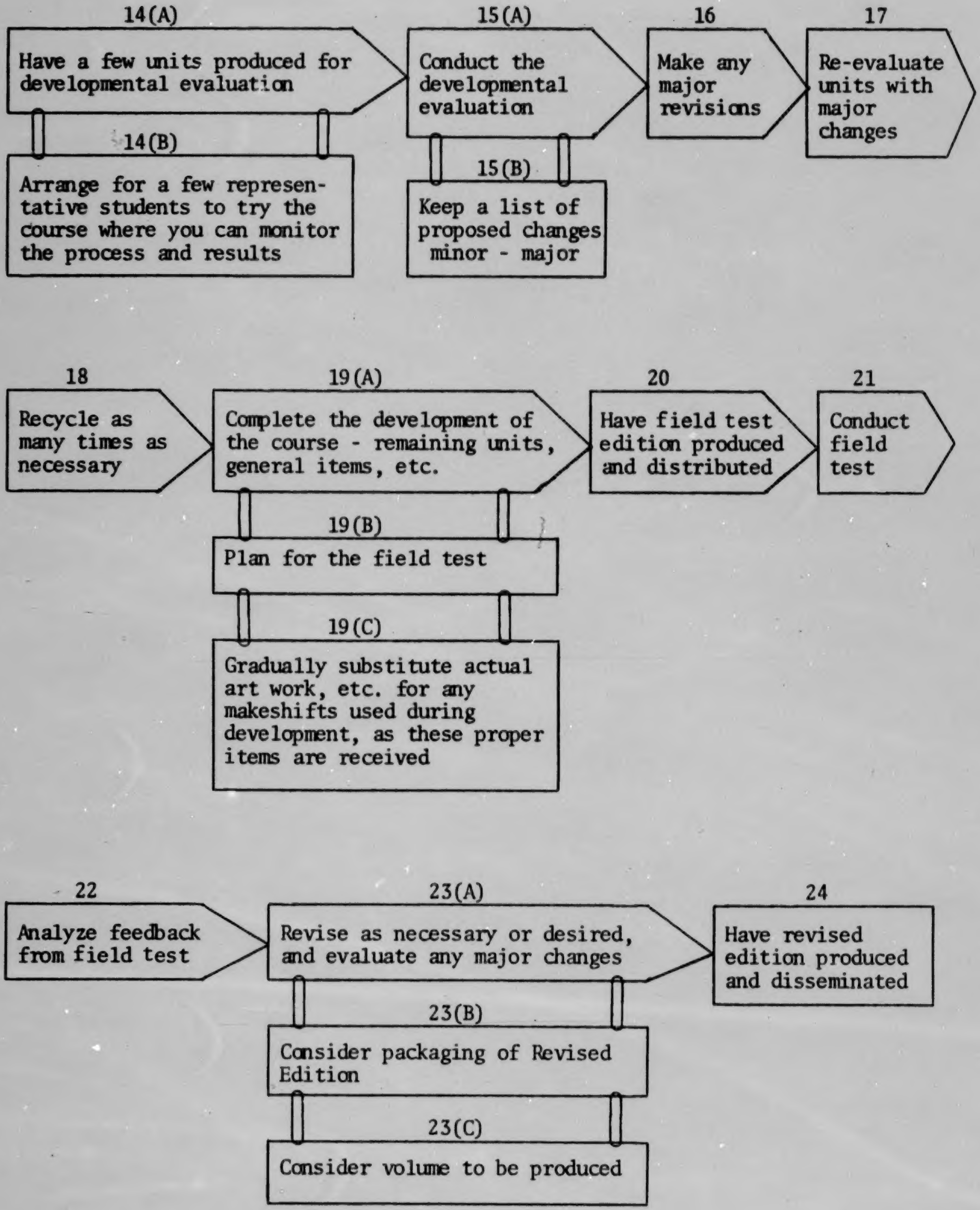
Following is a skeleton summary of the total process, after which there will be an elaboration of each step, sometimes in the form of questions. You might consider it as a course development check list.

---

* Educational Consultant and Program Developer
Training Research and Development Station

COURSE DEVELOPMENT CHECK LIST


1
List terms of reference
2
List learner characteristics and needs
3
Investigate instruction already available
If it is suitable, STOP HERE
possible, consider other priorities
unusable, GO AHEAD
4
List content
(1) Tentative
(2) Necessary in form of critical objectives with "topics" under each
5
Consider strategies:
Instructional approach
Student's dynamics
Media
Evaluation procedure
(Budget)
etc.
Search out relevant information
6(A)
Decide on strategies
6(B)
List special services and equipment required
7
Write a rationale of the course
8
Arrange the content in pedagogical order
9
Divide content into lessons or units
10
Write tentative objectives for Unit 1, converting "topics" to sub-objectives
11
Write instructional material for Unit 1
12
Re-examine the Unit 1 draft after an interval
13(A)
Draft the next few units in the same way
13(B)
Insure availability of special staff, services or equipment to be required at a stated time



14(A) Have a few units produced for developmental evaluation

14(B) Arrange for a few representative students to try the course where you can monitor the process and results

15(A) Conduct the developmental evaluation

15(B) Keep a list of proposed changes minor - major

16 Make any major revisions

17 Re-evaluate units with major changes

18 Recycle as many times as necessary

19(A) Complete the development of the course - remaining units, general items, etc.

19(B) Plan for the field test

19(C) Gradually substitute actual art work, etc. for any makeshifts used during development, as these proper items are received

20 Have field test edition produced and distributed

21 Conduct field test

22 Analyze feedback from field test

23(A) Revise as necessary or desired, and evaluate any major changes

23(B) Consider packaging of Revised Edition

23(C) Consider volume to be produced

24 Have revised edition produced and disseminated

1. List Terms of Reference

What is it you want to accomplish?

For whom?

Who is sponsoring the development of the course?
(It is not practical to attempt development of a long course without a sponsor.)

What are the sponsor's areas of interest or responsibility?

Is there a stated deadline, date, or is a deadline implied by the circumstances?
(Deadlines are something to be cautious about.)

What funds will be available?

What professional help?

What supporting assistance?
(as to typing, printing, art work, photography, acting, voice recording, editing, tape duplicating, equipment, materials.)

2. List Characteristics and Needs of Learners

Possible types of learners as you think they are:

What do they need, and what do they want?
(When the answers are different, perhaps you can present the needs in terms of the wants.)

Academic background

Socio-economic level
(What can they afford, if the course is not free to them?)

Sociological characteristics
(What would appeal to most? What might offend some?)

Numbers involved

Geographic location(s)

Availability for training

3. Investigate Instruction Already Available

Is there suitable instruction?
(No course will cover exactly what you want, in exactly the way you would choose to teach it. Perhaps two sets of materials could be combined, and there may be several approaches that would work.)

Is there instruction that could possibly be used, though not entirely satisfactory?

(Other priorities might make it inadvisable to launch into the long process of developing a course.)

Is there nothing usable?

(Then go ahead.)

4. List Content

Tentative content:

Describe the critical objectives (main points)

List possible topics under each

(Consult existing courses, occupational supervisors, generic skills reports, etc. Behavioural objectives take time to write, and you may delete some of the content, so it is usually not efficient to write the detailed sub-objectives at this stage. However, you almost have to write the critical objectives in order to clarify what you hope to do.)

Necessary content:

Delete all but the content that may be needed by the learners you have described.

5. Consider Strategies

(1) Strategies include

The broad instructional approaches:

(e.g., new or old math, a specific method for reading instruction, separate subjects or integrated materials, spiral or linear curriculum.)

The student's environment

At home?

In a community group?

In a library or other informal learning centre?

The student's contacts

By mail only?

Face to face

- with a peer group?
- with a tutor in a learning centre?
  - at the student's discretion?
  - at the tutor's discretion?
  - both?

The student's activities (dynamics)

When he is learning, proving he has learned, or applying what he has learned:

- Will responses be by
    - Manipulation?
    - Mental response?
    - Oral on tape?
    - Oral to himself?
    - Oral to a peer learner?
    - Written?

- Written in a book?
    - (If so, the book will serve only one student.)

- Drills on facts?
    - Oral stimulus and response?
    - Using study cards?

- Any peer interaction?

- Self-tests imbedded and/or separate?

- An instructor involved? If so,
    - What inputs from instructor?
    - Initiated by whom?

- What other checks or guidance to monitor student's progress?

- Will a certificate be issued on completion?
    - (If so, the course must provide criteria for certification; requirements of organizations demanding certificates must be considered.)

Media:

What media would best provide the desired dynamics (think big at this point)?

Which of these media have you the resources to produce, in terms of

- services, equipment and materials available?
- time involved?
- budgetary considerations?

As to the users, which of these media

- can they afford to buy?
- have they the capability of using? (e.g., is power available?)
- are purchasable with dependable lead time?
- can be serviced in the area?
- are not subject to frequent breakdowns?

In light of the above, which media are practical to consider?

Of these media, could one or more be eliminated and the function(s) performed by some of the others?

(You don't need to strive for a large variety; the fewer, simpler, more convenient and less expensive the media are, the more use will be made of the course - provided the media you select will do the job required of them.)

Formats:

What formats will
- best present the content?
- appeal to students?
  (colour printing is attractive but expensive; use of coloured paper is sometimes a good substitute.)
- facilitate storage and retrieval
  (use of colour may be helpful; control codes.)
- facilitate control of stocks
  (control codes)
- facilitate multiple use
  (many booklets, short tapes; all materials reusable.)

If books are not to be written in, what will the student retain for reference when he finishes the course?

- Nothing?
- A summary of some sort?
- An orderly set of his own work, organized with this end in view?

What formats have you the resources to produce, in terms of
- services, equipment and materials available?
- time involved?
- budgetary considerations?

Evaluation:

The bases for evaluation need to be considered before the course is constructed, and may be built in to a large extent:

How can the critical objectives (Step 4) be tested?
(You may wish to rewrite them in more specific form - e.g., the degree of proficiency required.)

(2) This step is a large one. In the course of it you should

List your own convictions in regard to questions such as those mentioned above;

List your areas of uncertainty;

Review research reports on the pedagogical questions involved:
- to check on your certainties,
- to relieve your uncertainties;

Find out what media are on the market, and what they are designed to do. As to the "new" items,

How new are they?

Are they yet generally available?

Who in your locality has used them?

Do they really work?
(Have all the gremlins been found and eliminated?)

But don't overlook new media that may solve some of your problems.
(In the tape-text language course Bonne Ecoute*, the normal speech was too fast for students just beginning to hear French, so the tapes were put through a speech compressor operated in reverse. The syllables and pauses were lengthened, without affecting the pitch of the voice.)

Get facts re comparative costs of various media, formats, materials, services, and the time involved in the production of them.

6(A) Decide on Strategies

These decisions you will have to live with throughout the development of the course, and perhaps for a long time afterwards. It would be very difficult to make major changes in these broad strategies when far into the development process. Therefore, time should be taken here to consider thoroughly the items noted in Step 5, their relationship to one another, and their implications.

---

* Bonne Ecoute is a tape-text program designed for adults who read French fairly well and who desire to become equally competent in listening and conversing. A first (experimental) edition will be ready for use in the spring of 1974.

6(B) *List special services and equipment required:*

At approximately what stage of the production process will each be needed?

Will it be needed for the developmental version?
(The closer the developmental version is to the planned final product, the more valid the developmental evaluations may be.)

Put the list away for future reference.

7. *Write a rationale of the course*

This will pull your plans together.

It will help to reveal any omissions or anomalies.

It will help to keep you on the track during development, and serve as an introduction and reference source for people who will assist you.

It will provide a start for the course manual, informing

- those who supervise students,
- those who decide what course materials to purchase or adopt.

8. *Arrange the content in pedagogical order*

Which critical objectives depend on others?

Which topics depend on others?

Which "learning tasks" present more difficulty?
(Here, a taxonomy is useful - Bloom's *Taxonomy of Educational Objectives, Cognitive Domain**, or some variation of it.)

E.g. These objectives are in order of difficulty:

Select the correct (learned) name for a concept when that name and others are given as choices;

Match several concepts and their respective names, when concepts and names are given in separate random-order lists;

Given the description of a concept, state its name;

---

* Benjamin S. Bloom (ed.), *Taxonomy of Educational Objectives, Handbook 1: Cognitive Domain* (New York: David McKay Company Inc., 1956).

Given the name of a concept, explain the concept;

Given a set of circumstances, state the concept which applies to them and how it operates in regard to them.

Should some prerequisites be reviewed in the course, before the content proper is introduced?

Will there be footnotes, backnotes, a glossary, or will everything be explained in the text?
(Explanations in the text are more readable.
Footnotes are easily available, and don't take reading time if the student doesn't need them.
Backnotes and glossaries are convenient as a repeated reference for any related parts of the text.)

Must the content be learned in that order?

9. Divide the content into lessons or units

Where are the natural divisions of the subject matter?

Is each unit to be a separate booklet, tape, or other instructional entity?

Would smaller units at the beginning be a motivational factor?

What will be the approximate limit as to length of any one unit, in terms of format?

10. Write tentative objectives for Unit 1

(1) Begin with the critical objectives written in Step 4. Under each one, convert the "topics" to behavioural objectives (sub-objectives).
(Express exactly what you want the student to be able to do when he completes the sequence leading up to each sub-objective; if necessary, be specific as to how well he should do it; sometimes you may want to state a time limit as an indicator of his achievement.)

(2) Behavioural objectives are conceived and expressed in terms of what the learner will be able to do - not what he will "know" or "understand," and not what the program or instructor is attempting to do for him.

(3) A topic may be difficult to express in behavioural terms, but if you can't express it in those terms, how are you going to test for mastery of it? The learner must show in some way that he has learned. When in difficulty you could say, "To demonstrate a knowledge of __________ by ______________."

(4) The strategies you have selected should be kept in mind while writing objectives, in order to take full advantage of the media and to keep the Unit compatible with the instructional approach.

(5) Writing objectives is time-consuming. At this stage the main thing is to express an objective so that you know exactly what you mean. If the perfect word escapes you, write anything that gives the meaning - you may change it all around when you write the material.

(6) Keep the list of objectives for Unit 1 before you as a guide for the Unit material. As you write an instructional sequence you make much closer mental contact with the subject matter. Dynamics come to mind, interrelationships of topics occur to you, ways of relating the content to the student's experience and interests, opportunities for humour that will lighten the business of learning, ways of accomplishing two objectives in one sequence (or rather, in two different uses of it by the student), the necessity for inserting another objective to make the chain of learning complete - all these and more ideas will well up in your mind as you write. Many of them will result in alteration of the objective, or the way it is expressed. You need an objective to start with, but it is likely to develop with the Unit.

(7) When the unit has been prepared, consider the objectives again:

Were they intended for your use only?
(If so, they can be filed at this point.)

Were they for quality control - to be referred to by someone who will edit the material to check for relevance, completeness, validity, etc.?
(If so, the objectives should travel with the Unit draft.)

Were they for an instructor who will assign the Unit or monitor the student's use of it?
(If so, they may be expressed in teacher language.)

Were they for the student?
(If so, they should be expressed in student language.)

Does a student need to see objectives?
(If he has some idea of where he's going, he has a better chance of getting there. If formal objectives are not provided for him, substitutes for them should be incorporated in the text at the beginning of the corresponding instructional sequences. There are some exceptions, but not in academic areas.)

11. Write the instructional material for Unit 1

(1) Remember the purpose is not just to inform, but to help the student learn.

(2) Don't just tell him what to do, but explain why it's worth doing - how it will help him.

(3) Picture a typical member of the target population, and prepare the material for him or her - or both - as if you were talking to the student directly. Be informal. If the student you picture has a sense of humour, tickle it when you see a good chance. If _you_ don't delight in humour, forget it: you can do only what _you_ can do.

(4) The approach implied here does not involve the set patterns and constraints of programmed instruction, such as very small steps of similar length, one-word responses, or becoming locked into a linear or branching type of progression; and the word "media" is not intended to include "teaching machines" which are merely mechanical page turners designed to keep the student from peeking at the answer before he makes his response. The individualized materials will be "programmed", but in a much more flexible and informal way, with steps and sequences of varying length to suit their purpose. When you help the adult to learn how to learn, and let him use a learning sequence until _he_ decides he has mastered it to the degree expressed in the objective, the idea of "peeking at the answer" becomes irrelevant.

(5) Relate the content to the student's needs or interests. Try to give him some skills and experiences that he can apply in his daily life.

(6) You need to have in mind some taxonomy of the levels of difficulty inherent in certain kinds of response demanded of the student. Bloom's taxonomy of the cognitive domain* or some adaptation of it may be useful. The most-used levels are just common sense, and should be observed automatically. Other levels may be referred to when needed. However, using the taxonomy as a steady reference can lead to using too many levels for every sequence; it is better to think of what would help the student, and then check to see that the steps are in order of difficulty.

(7) While the affective element is important in BTSD, a taxonomy is not very relevant.

---

* Bloom, _op.cit._

(8) Above all, keep the language simple and direct. If reading is required, make sure the level of difficulty is lower than probable reading ability of the students. In explaining a concept in Grade 7 math, the explanation should not require more than a Grade 5 or 6 reading ability - and Grade 5 would be the better. If you don't know the readability of what you have written, you can measure it with the Fry readability graph* or some similar tool. (See attached Annex.)

(9) "Reviews" are useful but dull, and are often skipped by the student. The same purpose can sometimes be served by making references to items previously covered, by providing incidental applications for them later, by cumulative testing, etc.

(10) Provide a self-test for the student at each main check point (each critical objective) and after most sub-objectives as well. These self-tests may be embedded in the text, or separate, or there may be some of both kinds.

(11) Self-tests, exercises, assignments, references, footnotes (backnotes or glossary entries) should be prepared before you leave the sequence to which they refer. It is easier while you have all the details in mind, and before you become involved with another topic or another sequence of instruction.

(12) As you prepare the material, ideas for the unit end test (if there is to be one) will come to you. Be sure to jot them down, along with the page number where the related sequence is to be found. Don't consider the unit finished until the end test has been prepared - it's difficult to come back to it later, and you won't do as good a job.

(13) Prepare descriptions of any audio-visual materials needed. List all items related to the unit - books, tapes, slides, study cards, exercises, end test, etc.

(14) As to your own approach to writing the materials,

Keep the rationale in mind.

Give your imagination and creativeness free rein.

---

* This graph was developed by Edward Fry, of Rutgers University Reading Center. It was first published in the April, 1968 issue of the Journal of Reading (a publication of the International Reading Association), with permission to copy. It appeared, with explanations, in "Here's How You Measure Readability" by Naida Waite (Canadian Vocational Journal, Fall, 1968, p.33). There are several systems for measuring readability, but this one is especially convenient.

Be receptive to insights and inspirations which will come to you as you go deeper into the subject - even if these mean changing what you have just written. It's easiest to change now.

If you have enough training and experience to develop a course, you should heed your own intuitions and common sense where they conflict with some current system.

The hardest word to write is the first one. Write something and get started. You'll go back and change the first part anyway.

If the well of inspiration goes dry, just picture that imaginary student you are writing for - what use this bit of content will be to him, and how you would help him to learn and appreciate it if he were sitting beside you.

12. Re-examine the Unit 1 draft after an interval

Put the draft away for a few days, while you start Unit 2 or do something else. Then re-examine Unit 1.

Are the objectives clear, concise, precise?

Will the instructional sequences help the student to achieve the objectives?

Are there any omissions?

If something was changed, was it changed in every place where it was involved?

If the student was told where to find the answers to an imbedded self-test, are the answers there? Are they correct?

Have the selected formats been adhered to?

If art work, audiotapes, slides, etc., are needed, are there adequate instructions as to format and content of these?

13(A). Draft the next few units in the same way

13(B). Ensure availability of resources

Ensure that any special staff, services or equipment will be available at a stated time when they will be needed.

14(A). Have a few units produced for developmental evaluation

You may want to produce these materials in some quick, economical way. "Printed" materials may be duplicated by some copying process. If audiotapes need to be duplicated, you may hook up a few tape recorders instead of sending the master tapes away for this service. If art work is needed, you may use pictures out of magazines or from other sources for this first trial run.

14(B). Arrange for a few representative students to try the materials

Developmental evaluation involves only a few students, working with the materials in a location where you can conveniently monitor their progress and reactions.

These few students should be carefully selected, and should be as representative of the target population as possible.

> (Consider age, sex, ethnic backgrounds, and learning ability as evidenced by some standard test; watch out for poor hearing and poor eyesight, and at least be aware if a student has a deficiency; one or two such students out of ten or twelve might make the sample more representative, provided they can cope with the materials.)

If the course is long, and each unit depends on the mastery of previous units, developmental evaluation requires students who will take the whole course. If you start the evaluation with too few units completed, the presence of these students may put pressure on you to produce more units as they are needed; you can't afford to let such pressures jeopardize quality. On the other hand, if you leave it too long, you will have created too much material without coming to grips with reality as to its value; it will be expensive to change, and you will be less likely to make needed changes.

If you can use students who are not under some financial compulsion to be in attendance every day, and who are not constrained by a time limit, you can excuse them from attendance if they catch up to you, or you can have them do something else for a day or so. They are there for your convenience, but their presence can create much undesirable pressure if you are not in a position to relieve it.

You might begin with very few students, and take in more when you are ready to re-evaluate units that have been revised following the first trial. In this way you will probably always have a chance to re-evaluate any unit that proves troublesome.

How will you recruit the students?

What will their schedule of study be?

> Full or half days?
>
> At what times?

What will their study environment be?

Will the activities of some disturb others? (Earphones may be necessary for some voice-reproducing media)

Will they be permitted to consult each other? (They should, if this is to be permitted in the final course dynamics.)

What rewards are involved?

Do the students just get a free course?

Will they receive some financial reward? If so, from whom, and implying what constraints?

Will videotapes, audiotapes, or other visual and/or auditory records of this group be used in subsequent instructor-training courses or in explaining the course to the public? If so, a form of release or agreement to this should be signed by the prospective student before he is accepted in the developmental group.

15(A). Conduct the developmental evaluation

You may have the students hand in all their written work, if you have time to look at it.

At least, you will want to observe the completed self-tests and unit end tests, if any.

Spend some time sitting quietly in the room to observe how the students react to the materials.

Are there any signs of boredom, fatigue, frustration?

Do they keep working steadily?

Do they handle the A/V equipment efficiently?

Do they succeed in synchronizing their use of two media if required?

Do they follow the instructions in the units, as to the way the materials are to be used?

You might go in as the "instructor" or "helper" (not as the developer, if you can avoid it), and ask the students to bring their difficulties to you for help.

You might talk to the students to get their reactions. However this usually brings only kind remarks. A question such as "What part of this unit did you have to work the hardest on?" might point to some sequence that needs revising.

You might have an evaluative questionnaire completed by the student at the end of each unit. The student may be more frank if this is anonymous, but it will be more useful to you if it is identifiable. Real anonymity is not often achievable in a small group.

You might tell the student that the unit he has just completed may be changed, and ask if he has any suggestions as to how it can be improved.

How much did the student actually learn from the unit, that he didn't know before?

Where there is an end test with many responses required, you may want to use the "Modified Gain Score"* as a measure of gain, as follows:

(1) Give the end test as a pre-test.

(2) Give it again as a post-test.

(3) Possible Score minus Pre-test Score equals Possible Gain.

(4) Post-test score minus pre-test score equals Actual Gain.

(5) $\frac{\text{Actual Gain}}{\text{Possible Gain}} \times 100 =$ Modified Gain Score (%).

15(B). Keep a list of worthwhile changes and suggestions from any source

Minor changes to be made before materials are produced for field testing.

Major changes that must be made in the developmental version for immediate re-evaluation.

Small omissions from early units may show up as you are developing later units - perhaps a term you wish you had introduced, if you are using the spiral curriculum approach. Deal with them in the later units if possible - change the early units only if necessary, or very simple to do.

---

* The Modified Gain Score has been used at the State University of Nebraska, and it may have originated there.

Keep a list of changes desired but not made, and add to it as further work and inspiration bring possible improvements to mind.

Some minor improvements of format you can incorporate in the current and future units, and list for incorporation in the completed units when the revised edition is prepared.

16. Revise as necessary for immediate re-evaluation

Only major changes call for re-evaluation:
E.g., the complete rewriting of one or more sequences; the addition of a sequence, an exercise, etc.

17. Re-evaluate units with major changes

Use new students if possible, but you could also have those who used the first version try the new one and comment on it.

18. Recycle as many times as necessary

If the second version doesn't work, you might check to see if all prerequisites have been provided for the failing sequence. If the problem is failure on the unit end test, you might suspect the test itself, and also check to see if the unit has provided for enough review. Is the unit too long, in terms of time required to complete it? Is it boring? Is it relevant to the student's needs and interests? If there appears to be no general cause of failure, rewrite and re-evaluate again.

A unit on "ordering from a catalogue" might prove to be a "drag" for the men in a literacy class, but quite acceptable - though difficult - for the women. This is a task a husband is inclined to leave to his wife. Perhaps that unit should be considered optional. If two units are very similar and independent in nature, they should be separated in the series to avoid boring the learner.)

19(A). Develop the rest of the units and prepare the general items

General items may include:
- A course manual
- A book of answers
- A special tape for some purpose such as practice in listening, practice or tests in spelling.

A book, tape, or combination of media to show the student how to use the course or operate the media involved.

It is important that users be able to find a specific topic in the course materials when they want it. A detailed table of contents in each booklet will help - but why not put it on the cover where it can be seen without having to open the book? A list of critical objectives, or all objectives, placed in the manual, is useful, but it might well be followed with a "content analysis" in summary form, which could be skimmed through more quickly.

It may never be necessary to include an index, and it certainly would not be practical until the course materials are in their final form, after the field test.

19(B). Plan for the field test

(1) Students should be representative of the target population.

Consider age, sex, ethnic backgrounds, learning ability as guaged by some standard test.

If the course is to be used in a wide geographic area, several different parts of that area should participate in the field test.

(2) How many field-test students do you need to give a significant evaluation? How many students, in what geographic locations, can be monitored efficiently?

(3) How much work will the feedback process entail for the field instructors or supervisors, and for your own office?

(4) If instructors will be involved, you will need to inform them of the purpose, principles and nature of the course, and ensure that they will be able to use the materials in the manner intended. Much of this can be covered in the course manual. However, it will be more helpful to have a familiarization seminar, with opportunity to handle the materials, use the media, and see demonstrations of some of the processes. Such a seminar is almost necessary if the course is an innovative one.

(5) Those who will monitor the field trial will need to understand the course, as well as what sort of feedback you want, and how you want it reported.

(6) You will want feedback as to how well the course is liked, in addition to its effectiveness and efficiency. If you can arrange to talk with some of the students, as well as some of the instructors, tutors or supervisors, this will be very helpful.

(7) You may provide a statistical form for feedback, but this should be supplemented from the field by informal assessments and anecdotal reports of particular significance. Statistical reports should show the progress of each individual student, along with significant personal data about that student. (Summary statistics alone are almost useless to the course developer; much valuable information is buried in totals, averages and percentages.) Personal data may reveal significant group tendencies or preferences.

Personal data should be reflected in any statistical reports - e.g., breakdowns according to age, sex, language spoken at home, etc.

(8) You might have some of the students' work on unit end tests sent in, but if you hope to handle much raw data you will need to limit the numbers involved or know that you can get plenty of help in sorting, recording and analyzing the data.

(9) Drop-outs are of particular interest in a field test, but it is difficult to analyze their implications. Many drop-outs don't give a genuine reason, and some just disappear without giving any reason, so an attempt to record reasons is probably useless. However, if the same or similar content has previously been presented in the same area by means of another course or approach, the two drop-out rates for similar periods might be compared.

(Make sure that field-test students achieving early completions don't get counted as drop-outs!)

(10) People sometimes assume that a field test should include a control group for comparison with the experimental group, but often this is not very useful. If the new course is truly innovative, it may be capable of producing results and stimulating interest not possible with the old course, and therefore there is no meaningful basis for comparison - especially, if the final criterion is a test. In this case you can hardly test the control group on items they haven't had a chance to learn, and if you use a control group test for the experimental group, they won't have a chance to demonstrate the extent of their superior gains. It would be more useful to compare the average length of time taken for completion of this and some previous courses with similar content; also the percentages of completions and drop-outs, if this information can be obtained. The most important thing is to find out if the new course works well, and what specific amendments, if any, should be made. "Working well" includes appealing to students as well as being effective and efficient in helping them to learn.

20. Have the field test edition produced and distributed

Don't hold field test material back to make small changes. Put these changes on your list for later attention, and let the material go to those who will be producing it. The main thought now is to start the field test as soon as possible.

At this point you want the materials to be as close as possible to your idea of their ultimate form. During the final development stages you will have been receiving actual items of art work or other media, and substituting them for any makeshifts used in the developmental evaluation stage. At this stage, the materials will probably be produced by commercial or in-house printers, tape duplicators, etc. Printers will probably require a "dummy" for each booklet involved. This will be a duplicated version, including a dummy cover and the pages showing publisher and copyright information, inside title page, etc. If the text is to be printed on both sides of the paper, the pages will be taped back-to-back, the odd numbers always being right-hand pages. The printer may also require summaries as to the number of booklets, total number of pages, etc., and he will need information as to stapling or binding and other details of production.

In the case of audiotape cassettes, commercial duplicators duplicate both (or all) tracks at one time. If the masters were to start at the beginning of each side, the total length of the tape would be used; if a blank used for duplicating is slightly shorter (and they do vary), some content will be lost. The safeguard is to stop recording the first side well short of the end; turn the cassette and start the second side at that same place on the tape.

21. Conduct the field test

Ideally, someone should monitor the field test operation - you, or someone who is fully familiar with the course and the way it should be used.

Is it being used as directed?

Are the students representative?

Are there any serious environmental elements militating against it?

Is any serious defect showing up generally or in regard to any specific group?

What are the reactions of instructors, tutors, supervisors, or whoever is the immediate contact for the student?

22. Analyze feedback from the field test

Use very lead you can get to assess the value of the course and decide which parts or what aspects, if any, need changing.

Study the statistics, student work, suggestions from the students and from the instructors, tutors or supervisors, the observations of whoever monitored the field test, and consult your notes of any conversations you have had with those involved, and any other feedback sources. Some impressions will conflict, and will have to be weighed carefully. Some suggestions, while good in a sense, may be completely out of character for the course.

Use the feedback, but filter it through your own evaluative processes, keeping in mind the aims and rationale of the course.

23(a). Revise the field-test version

It is unlikely there will be many major changes at this stage, but if a major change is necessary, this will mean recycling through several previous stages. Developmental evaluation will be a problem, unless you are rewriting the whole course. You may have to look for a few students who have forgotten the specific - subject matter you are revising, and give them a quick review of the prerequisites.

At this stage you will consider the small changes you have been listing as they occurred to you, and incorporate or adapt those that still seem desirable.

As you read over the units at this stage, you may want to make the tone less formal in some places, make a sentence clearer, use a shorter word or explain the long one, change an example that proved perplexing to some, etc. Unless the whole course is being retyped, retaped or otherwise redone for some general change of format, it may be possible to make these small revisions in the field-test originals.

23(b). During the revision process you will need to consider the packaging of the revised edition.

What kinds, shapes and sizes of items must be included?

Do these need to be in related pairs or sets within the kit or package, or will they be organized according to the kind of medium, or according to size and shape?

Will the container be used for storage and retrieval when the course is in use?

Who will retrieve and put away - the student, or an instructor, tutor or supervisor?

Will labels need to be designed and printed for tape cassettes or other non-print items?

Who will put the labels on? (The producer is probably the best - e.g., the person duplicating the audiotape.)

How will the items be numbered? (In a large course, each separate item should have a short coded designation of some kind, for reference, printing control, stock control, ordering, etc.)

How might the container's be designed and of what materials might they be made? (Suppliers will be helpful in giving estimates of cost and suggesting improvements in the design.)

23(c). Consider volume to be produced

Estimate the probable demand over a given period - e.g., two years.

Consider available storage space for stock on hand.

Consider the cost of stock piling in relation to the budget.

24. Have the revised edition produced and disseminated

During the first few years, you may want to know where the course is in use, and you can probably make some administrative arrangement to receive this information.

GENERAL QUESTIONS AND REMARKS

1. How long does it take to produce a course?

It is difficult to foresee. This kind of development is in the nature of action research, and, like any research project, the date of its successful conclusion is not predictable. Can you estimate the development time? Sometimes you have to do so, but you'll probably be wrong. The first five units may average 10 days each, and the sixth one may take 30. Besides that, all sorts of unforeseen things will happen - people you depend on will have to leave or be absent, machines will break down, occasionally something will get lost, sometimes the well of ideas and creativeness will go dry, sometimes you have to stop to sleep and eat. My personal advice to the developer who is asked how long it will take, is to make as reasonable an estimate as possible and then multiply it by 5 or 10. It doesn't matter which - either one will be wrong. An alternative is to decide you will take just so many days to create each unit, and then keep to the schedule; in this way you grind out the units like sausages, and they show about as much evidence of creative imagination. If your supervisor needs an estimate for administrative purposes, it is important to let him or her know that a close estimate is not possible. Don't lead the administrator into promising or advertising a completion date that may not be attainable.

2. How do you work with an assistant developer?

Sometimes the situation demands that a course be completed by a certain date. You must do it in that time or not at all. Few people, especially early in their careers would opt for not doing it. If you decide it must be done in a short time, then you will need one or more persons to help you with the actual creation of the materials. (This is totally different from having others help with certain parts of the effort while you remain the sole creator.) Let's say you divide the course into two levels, and that you will create the first level and your colleague the second level. How can you make the best use of the colleague's abilities and keep some coherence between the two levels of the course? Here are some suggestions:

(1) Recruit someone who has pedagogical knowledge, experience and creative ability, and who also has a good command of the subject matter. If you have to do without one of these, it had better be the experience.

(2) Discuss the project with the recruit, both to acquaint him or her with it, and to explore how well the recruit's ideas and convictions fit with the ideas and convictions by which you hope to shape the course. If the fit is reasonably good, select the recruit; if not, look further.

(3) If all of the basic decisions about the course have not already been made, include the colleague in the decision-making process. By all means, make the laying out of the topics a joint effort, for both levels, so that each will know what the other will be doing. Share this effort, but remember you are in charge of the project. You are responsible for the outcome, and you make the final decisions.

(4) Draft the first unit or two of your level, and discuss the drafts with your colleague, to establish approach, "tone", format, etc.

(5) Have the colleague show you the draft of his or her first unit, and discuss it. Have the first one or two units worked over until they satisfy you. This doesn't mean that they will be identical to what you would have done, but, rather, as the other person's output, they achieve a standard which you would be willing to accept for the field test edition.

(6) When you are satisfied that the colleague knows what you want and can create material acceptable to you, let the colleague go ahead and you do the same, at your respective levels. The colleague may consult you, and you will look over the completed units. You may show your completed units to the colleague if he or she desires this, and if there is time. Otherwise the two levels may have to be created in a large degree of separation. In any event, the colleague will be creating the unit which follows your last one, long before your last unit is begun.

(7) How will the colleague obtain developmental feedback, when no students have yet completed the first level of the course? Some compromise will have to be made here; maybe one or two students can be found who have covered the content long ago. A quick tutorial review of the first-level content may prepare them to work with the second level units.

(8) While the course is out to field test, go over the Level 2 material, and make notes of changes that will make it cohere with your own material - add a reference to some Level 1 item here, a touch of humour there, bring the format better into line, substitute some preferred approach or dynamic, and so on. In other words, note the changes that will make it yours.

(9) When the field test is completed, proceed to amend both levels yourself. If credits are being given, you can give your colleague credit for what he or she has done.

3. How does anyone know how to write a course?

It is helpful to have been present when a course was being designed - to know at first hand something about laying out the topics, sequencing them and writing behavioural objectives, and to be prepared psychologically for some misadventures.

The preliminaries are important, but the course comes to life in the actual creating of the materials which the student will use. Here the course writer must be guided by principles that have become almost automatic; such as these:

Go from the familiar to the unfamiliar.

Go from the easy to the more difficult (and make sure which is which).

Prepare the mental set of the student for what he is about to undertake.

Don't present easily confused items at the same time - separate them well in time and space.

Don't use "elegant variation" in language - always use the same word to represent a thing or idea until it is well established; then, if there is a generally accepted alternative wording, it may be introduced and used interchangeably with the first; otherwise, stay with the original wording. This may mean using a word three times in one sentence; do it.

Keep the language within the assumed or established reading or listening ability of the representative student.

If, in using what he is learning, the student will need random access to it, make sure that he achieves random access to it during the learning process, and that he knows why he's doing it. (For instance, he shouldn't have to go through the whole "7 times" table to arrive at "7x9".)

Test the student on only what he had an opportunity to learn. If you want to give him a chance to "discover" or "apply" or "extrapolate", do this in the learning sequences. Then you may (or may not) put an item of this kind in the test which follows.

Keep up your reading of journals and research reports in your field. It's hard to do two or three years' reading when you start to develop a course.

Be a student yourself from time to time, learning something that really taxes your capabilities. Otherwise, how can you maintain any personal knowledge or feeling about the learning process and the business of being a student?

Never engage in one-up-manship - don't play cat-and-mouse with the student. Keep your role as *helper* firmly established in your mind and his. If there is a joke, he must know you are laughing too, and at the same thing.

Never tell him something is going to be easy; if he misses the first time, he'll think he's stupid; if he succeeds, you've spoiled his satisfaction.

Provide distributed learning - by a spiral curriculum approach, dealing with a topic several different times, on increasingly sophisticated levels. Also encourage the student to distribute his learning efforts over several moderately long sessions rather than one very long one, and to take 10-minute breaks occasionally.

Define any technical words you must use, show how to pronounce them if this is not obvious, and give examples of their use.

Sometimes you must use a difficult non-technical word because it is one generally used in that context. A formal definition might insult the student who knows the word, and you can't assume another student will look it up if he doesn't know it. You can usually introduce the word in such a way that its meaning is made clear without a formal definition.

Keep the language clear, simple and direct.

Keep that imaginary student beside you, and communicate with him.

ANNEX

THE FRY READABILITY GRAPH

This graph, developed by Professor Edward Fry, of the Rutgers University Reading Centre, is useful in estimating the difficulty of reading materials.

It is based on the assumption that long sentences and long words make reading difficult. The results are approximate, because some short technical words may be unfamiliar, and some short words may be combined into unfamiliar phrases. However, this has proved to be a very useful and convenient means of estimation.

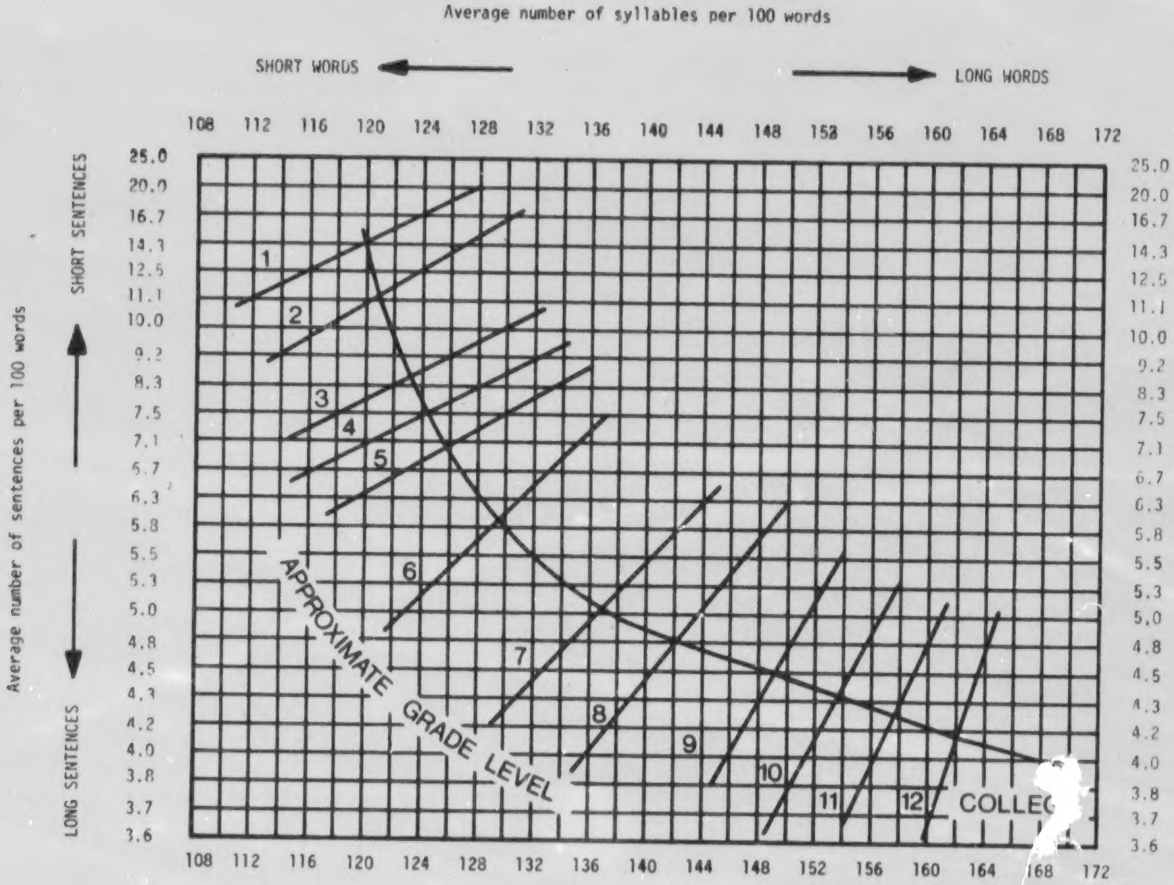
The process is as follows:

1. Select three passages near the beginning, middle and end of the material, and count a 100-word sample in each passage. Ignore all proper nouns.
2. Count the number of sentences in each 100-word sample. If the sample ends with an incomplete sentence, estimate the included part of that sentence to the nearest tenth of the sentence. Find the average of these numbers for the three samples.
3. Count the total number of syllables in each 100-word sample. (You count one syllable for each vowel sound that is pronounced. For instance, "bat" has one syllable; watch, 1; through, 1; over, 2; inches, 2; themselves, 2; magnetic, 3; easily, 3; continental, 4; dictionary, 4; formidable, 4.) Find the average of these numbers for the three samples.
4. On the graph, find the horizontal line that represents your average number of sentences per 100 words; then find the vertical line that represents your average number of syllables per 100 words. Place a dot where the two lines cross each other. Read the grade level for the section of the graph where the dot falls.

(Please see the graph on the following page.)

GRAPH FOR ESTIMATING READABILITY

by Edward Fry, Rutgers University Reading Center



Explanation: (a) The more sentences you find in 100 words, the shorter the sentences are, and the easier the reading level is. Therefore, Grade 1 is near the top of the graph, and "college" near the bottom.

(b) The fewer syllables you find in 100 words, the smaller the words, and the easier the reading level. Therefore Grade 1 is near the left of the chart, and college near the right.

(c) If the dot falls far to the right of the lines that cross the main graph line and above them, you have very long words in very short sentences; if it falls far to the left and below, you have very long sentences made up of very short words. In either case, you might consider the material to be unsuitable for classroom use.

Suggestion: Counting the hundred words is easy, but counting the syllables needs a different strategy. One almost has to pronounce the words mentally to be aware of the syllables, and one cannot be counting at the same time. A convenient method has been to put a finger down for each syllable and tally the fives in the usual way (~~////~~). Then the syllables can be totalled from the tally. This tally (~~////~~) would represent 25 syllables.

Credit: The graph was published in the April 1968 issue of the *Journal of Reading* (a publication of the International Reading Association). The author and publisher generously gave permission for free use of the graph with suitable credit.

CHAPTER VII

COURSE DEVELOPMENT
FROM THE
ADMINISTRATOR'S VIEWPOINT

Naida Waite*

Designing and developing a complete course is not the kind of project that can be done by a teacher in spare evenings. In addition to professional expertise, it requires clerical and technical assistance, money and time. We'll come back to the subject of time.

In the following remarks regarding course development, we are talking about an individualized course. Here, the course materials have the main responsibility for presenting the content and helping the student to learn. The new individualized materials are designed in a flexible, informal way, and provide a variety of learning activities or dynamics. They help the student to learn how to learn, and let him use a learning sequence until *he* decides he has mastered it to the degree expressed in the objective. He works at his own pace, skips over what he already knows, and asks for special help when he needs it. The teacher or tutor becomes a guide and resource person, diagnosing difficulties and helping the student overcome them, and acting as the final judge of achievement.

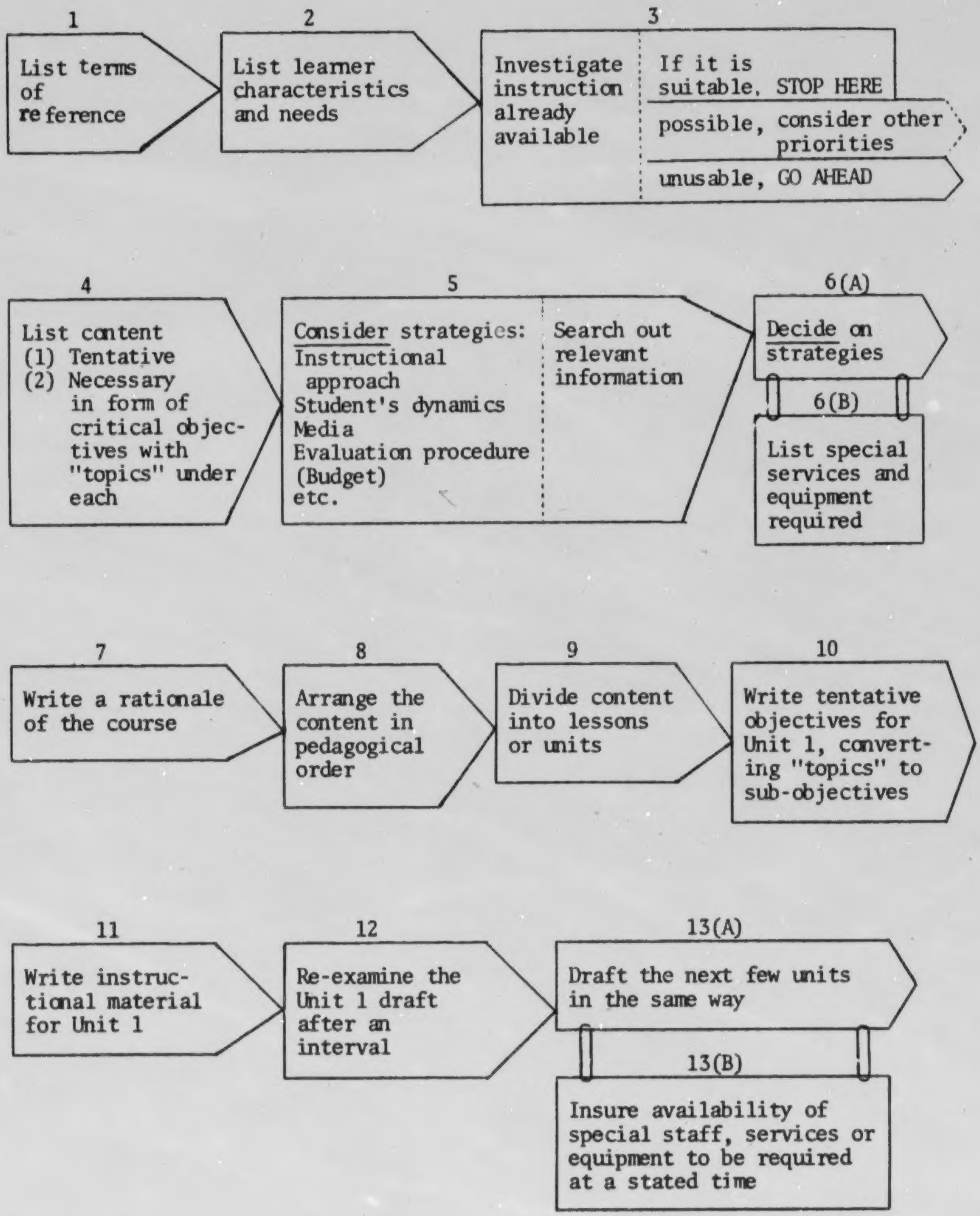
We are also talking about a subject area that is highly structured, such as literacy or a second language, where sequential learning is important.

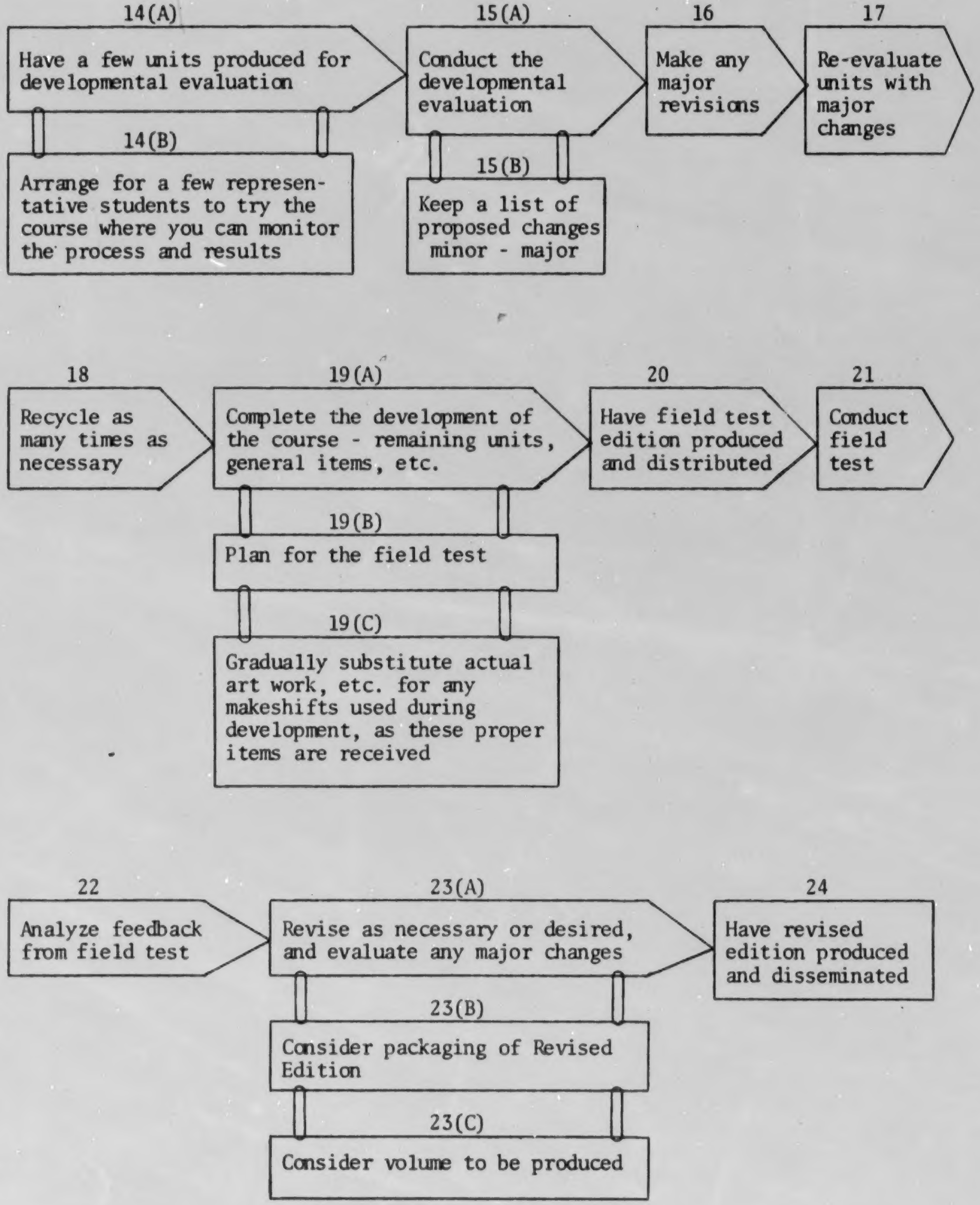
Let's take an overview of the total development process for that kind of course. Here are the main steps.

---

* Specialist, Basic Literacy Programs
Training Research and Development Station

COURSE DEVELOPMENT CHECK LIST


1
List terms of reference
2
List learner characteristics and needs
3
Investigate instruction already available
If it is suitable, STOP HERE
possible, consider other priorities
unusable, GO AHEAD
4
List content
(1) Tentative
(2) Necessary in form of critical objectives with "topics" under each
5
Consider strategies:
Instructional approach
Student's dynamics
Media
Evaluation procedure
(Budget)
etc.
Search out relevant information
6(A)
Decide on strategies
6(B)
List special services and equipment required
7
Write a rationale of the course
8
Arrange the content in pedagogical order
9
Divide content into lessons or units
10
Write tentative objectives for Unit 1, converting "topics" to sub-objectives
11
Write instructional material for Unit 1
12
Re-examine the Unit 1 draft after an interval
13(A)
Draft the next few units in the same way
13(B)
Insure availability of special staff, services or equipment to be required at a stated time


14(A)
Have a few units produced for developmental evaluation
14(B)
Arrange for a few representative students to try the course where you can monitor the process and results
15(A)
Conduct the developmental evaluation
15(B)
Keep a list of proposed changes minor - major
16
Make any major revisions
17
Re-evaluate units with major changes
18
Recycle as many times as necessary
19(A)
Complete the development of the course - remaining units, general items, etc.
19(B)
Plan for the field test
19(C)
Gradually substitute actual art work, etc. for any makeshifts used during development, as these proper items are received
20
Have field test edition produced and distributed
21
Conduct field test
22
Analyze feedback from field test
23(A)
Revise as necessary or desired, and evaluate any major changes
23(B)
Consider packaging of Revised Edition
23(C)
Consider volume to be produced
24
Have revised edition produced and disseminated

If suitable individualized material can be found, it is not practical to launch into the development of a new course. But how do we interpret the word "suitable"? No two cooks make their beef bourguignon in exactly the same way, but the clientele may be equally pleased with both. No two teachers teach in exactly the same way, but both may be effective. A teacher will never find an individualized course that covers exactly the desired content in exactly the way he would teach it. He may have to combine the relevant parts of two or more courses, and find out if the individualized material will do the job expected of it. But we assume that the student will have access to a teacher, tutor, or some helper, who will provide further explanations when needed and suggest further learning tasks. Therefore, the question is, "Will the course do the expected job with a reasonable amount of supervision and help?"

Let's assume we have decided to develop a complete course of the individualized kind referred to, which, if it had been presented in a traditional classroom, would have been scheduled to occupy 9 or 10 months. Let's say it will contain printed words and other media. The questions that immediately come to mind are: Who should develop it? What about media? How should the course be evaluated? What if a unit or sequence fails to work? How long will the development take? What will the total cost be?

We'll start with "who". The developer should be someone who knows the accepted principles of learning (and let's be concerned with learning, rather than teaching), keeps abreast of current research in education (and is able to distinguish useful research from the trivial and ill-conceived), is not afraid to innovate, has a lively imagination and a way with words, appreciates what the various types of media can do, and is perceptive as to students' difficulties and interests. To have been present when a course was being designed and developed would be an advantage, especially in laying out the topics, sequencing them, writing behavioural objectives, and being prepared psychologically for a few misadventures. Continuing to be a student from time to time in areas which tax the capabilities would also be helpful, for how else can one maintain a first-hand knowledge or feeling about the learning process and the business of being a student?

There are many media to select from, and more are constantly appearing on the market. How many different media should be introduced in a single course? If we want to use ten different kinds of media that will best produce them - one for each. But two or three media, including print, will be our limit, for we want to avoid inconvenience to users, the complexity of many different machines, and unnecessary expense. With ingenuity, we can usually make one medium perform almost the same function as another. For instance, many different dynamics can be accomplished with the tape-text combination.

While the newest inventions may be plagued with delays in delivery or with performance problems that haven't been overcome, it is nevertheless important to keep informed of new products. A new kind of medium, or a new feature in an old one, may solve an otherwise difficult problem.

For instance, the voice compressor, which changes the speed of speech without altering the pitch, solved a problem in a second-language program. The ordinary speech as recorded was too fast for novices to distinguish the pronunciation clearly, so the compressor was used in reverse to slow down the speed.

How should the course be evaluated? Small-scale evaluation should be conducted from day to day during the development process, and a larger-scale field test should be used to evaluate the completed course as to its effectiveness, efficiency, student appeal, administrative convenience and so on in several locations and environments which represent its intended target population.

The developmental evaluation is done with a few students - say ten or a dozen - who use the materials in a location where the developer can conveniently observe student reaction, the learning process and results. This enables the developer to keep in close touch with reality, shaping future units on the basis of experience. It helps to avoid costly major rewrites, and it shows up difficulties at an early exploratory stage while the developer is still quite willing to make a change.

Since individualized instruction facilitates continuous intake, the few students used in development might well be enrolled in two or three stages, in the hope that some would be coming along behind the others and be available for the second trial of a unit that has to be rewritten.

The field test will not require the immediate presence of the developer, although it should ideally be monitored by the developer or someone who knows the rationale of the course and is familiar with the materials. If the course is innovative, preliminary training should be given to the teachers, tutors, or whoever is to help the students on their way through it.

Should there be a control group with which the field test groups could be compared? In many cases this attempt to be scientific merely clouds the issue. Let's remember we have developed this course because nothing already on the market was suitable. We went through the developmental evaluation in order to shape our course into something that would work. Now we want to expose the materials to more and different students, different teachers or tutors, different geographical locations, and the absence of any super-normal effort on the part of the students, which might have occurred in the case of students who helped with the developmental evaluation, through regarding themselves as a chosen, elite group. The immediate purpose is to see if this broader exposure will reveal any shortcomings that didn't show up previously, and to receive suggestions from those who represent the ultimate users. The aim is to gather information on which to base revisions for a final edition.

And let's remember that a great deal of important information will be of the anecdotal type, which is lost in the totals, averages and percentages of tabulated hard data. We need both kinds of feedback, for we must know how well the students like the course, in addition to how well it helps them to learn. Drop-out statistics are meaningful, but reports as to students' enthusiasm and initiative in making use of what they have learned are also helpful. We need to know if a specific sequence has been found difficult by many students, if some reference has proved incomprehensible to students in some area, if some features of the materials have proved inconvenient. Every possible means should be taken to gather useful information from the field test.

Let's go back for a minute to the developmental evaluation. What happens if a unit or sequence doesn't work well enough? It has to be redeveloped until it does do the job expected of it. It may have to be recycled through the development and evaluation stages more than once. But let's remember this is action research. The developer, with an open mind, is trying something out - testing a hypothesis, if you like. There are good reasons for expecting that it will work, but no guarantees. The developer who is exploring the impact of a new approach has a right, at this stage, to be wrong. Unless this is clearly understood by all concerned, including the developer, there is no point in expecting original or innovative output. A unit rarely fails completely, but some decisions for change may necessitate a complete rewrite, and a rewrite necessitates recycling.

That brings up the question as to how long the development will take. This is difficult to foresee. It is action research, and, as with any research project, the date of its successful conclusion is not predictable. If the situation would dictate a very early deadline, it might be better to make do with some barely usable materials, and either postpone the development of a new course or let the development process occupy whatever time is required to conduct it properly.

If, for administrative purposes, it is necessary to estimate development time, we might make a reasonable guess and then multiply it by 5 - or 10 - to allow for staff absences, staff training, problems in finding staff, machine breakdowns, delivery delays, recycling of revised material, occasional misplacement of papers, library searches that must be made to ensure the exactitude of a reference, times when the well of creativeness runs dry through over-use, the endless checking and rechecking of prepared materials, and the time spent describing the project to visitors who have made a journey to hear about it.

Sometimes the development time can be reduced by providing one or more junior professional assistants to the developer, in addition to the clerical and technical people already mentioned. These assistants may do detailed work such as looking up references, drafting exercises, helping with the developmental evaluation, tape recording, and so on. This arrangement is convenient and extremely helpful. The developer and the professional assistants work closely together on the same lesson or unit as they make their way through the course.

Sometimes it appears desirable to have two or more senior professionals develop the course simultaneously. For a course where modular units are being designed to function independently, the employment of two or more developers is a commendable time-saver. However, in the case of a highly structured course where sequential learning is important, such as literacy or a second language, it raises many problems. But let's assume it's necessary in our case. Here are some of the problems and a few solutions:

1. If chaos is to be avoided, one of these developers must take the main responsibility and make the final decisions. In fact, one person should guide the preliminary planning and design, so there will be unity of purpose and approach.

2. When a competent second developer is employed, the only way to profit fully from this talent and financial outlay is to give the person freedom to be creative. So the two developers need to "get on the same wave-length" and then develop their respective parts of the course - probably dealing with different levels or blocks of the curriculum. They have a better chance of getting on the same wave-length if they're somewhere within the same wave-band to begin with. This might be ensured by having the chief developer select the second one, exploring the compatibility of their ideas and convictions.

3. By allotting blocks or levels of content, the chief developer can facilitate some continuity and coherence in the student materials - at least within each block or level. This is achieved partly by making reference to previous examples and concepts, as is done in the spiral curriculum approach, where a concept is dealt with several times on successively more sophisticated planes. After an orientation period, during which the chief developer supervises the assistant's work very closely, the assistant must be left free to proceed more or less independently, supervision occurring mainly on completion of each lesson or unit. But how can the developer of level 2 achieve continuity and coherence by referring to examples not yet created by the other developer? And let's remember that the first unit of the second level must be created at a time when the first level is barely started. Here, a certain lack of continuity will probably have to be tolerated for the field test version. When resulting revisions are being made, the chief developer (perhaps, by that stage, being the sole developer) can bring the second-level units into continuity and coherence with the first level, which we will assume he elected to produce himself.

4. Developmental testing also presents a problem. The only students who can properly test the early units of level 2 are those who have already covered level 1, which does not yet exist. Some compromise has to be worked out here, and it won't be entirely satisfactory.

But let's admit that two or more developers are sometimes considered necessary in producing this kind of course, and that this arrangement has been used with success. The main point is that one of them should be in charge of the project, and that this fact should be understood and accepted by all concerned.

The last question is, "How much will the development cost?" This depends on the time it takes, the number of professional and supporting staff members involved, the media selected, the processes required to produce the "software" for those media, the size and geographic locations of the field-test samples, and the work required for the kind of feedback analysis decided upon. It cannot be expected that eventual sales will repay the cost of development, and this is why a full-scale course development project has to be sponsored by some organization which can commit the needed funds. It is also, probably, the main reason why commercial publishers have not been able to satisfy all the specific needs for training materials, and all the needs to develop innovative materials to fit the changing times.

It is safe to assume that the development process will require two, three, or perhaps four years. Therefore, the administrator may be spared the necessity of stating a total budgetary amount, except as a tentative projection, and may be able to arrange the allotment of annual amounts for the work in hand.

As we said at the beginning, course development requires professional expertise, clerical and technical support, money, and TIME. Money, as well as time, is an unknown quantity.

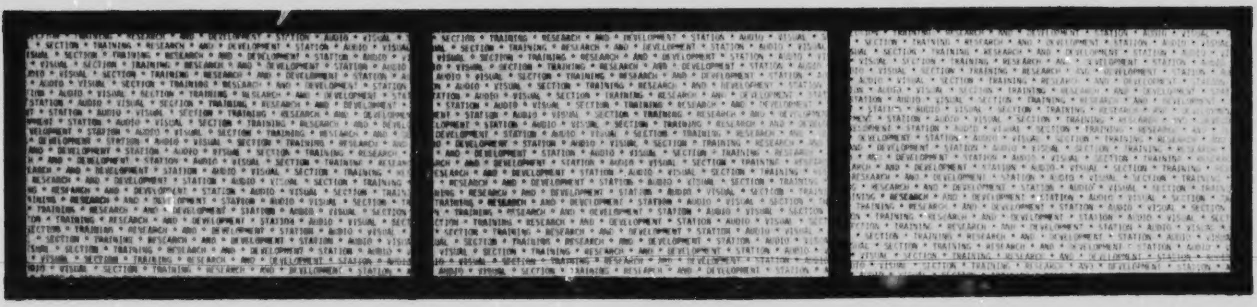
CHAPTER VIII

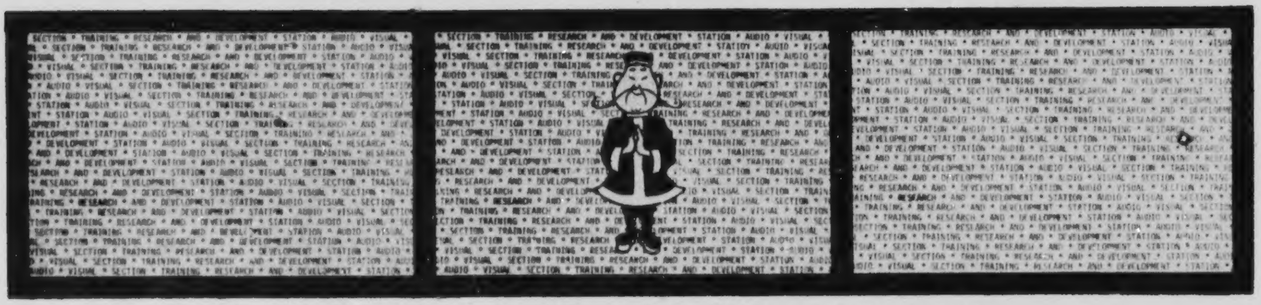
PLANNING AUDIO VISUAL SOFTWARE

Ross Ingroville*

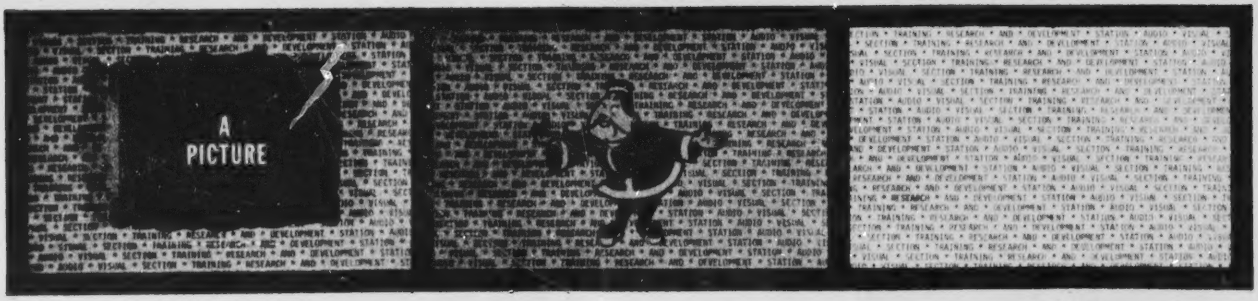
---

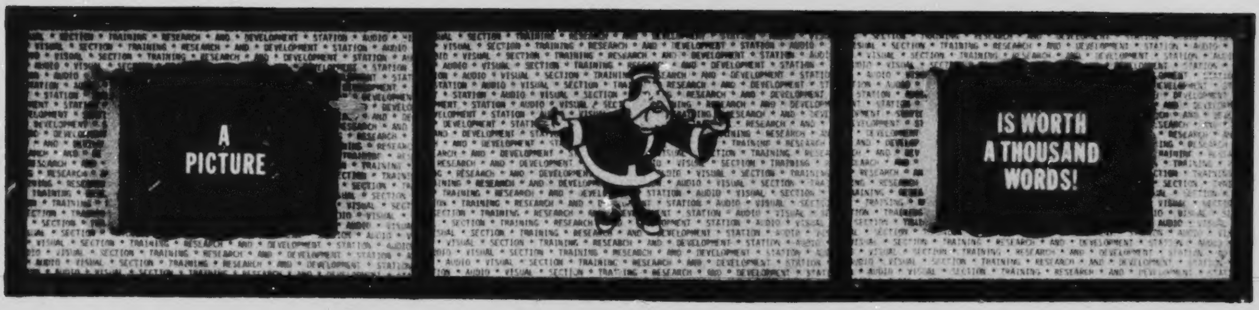
* Head, Audio Visual Technology Unit

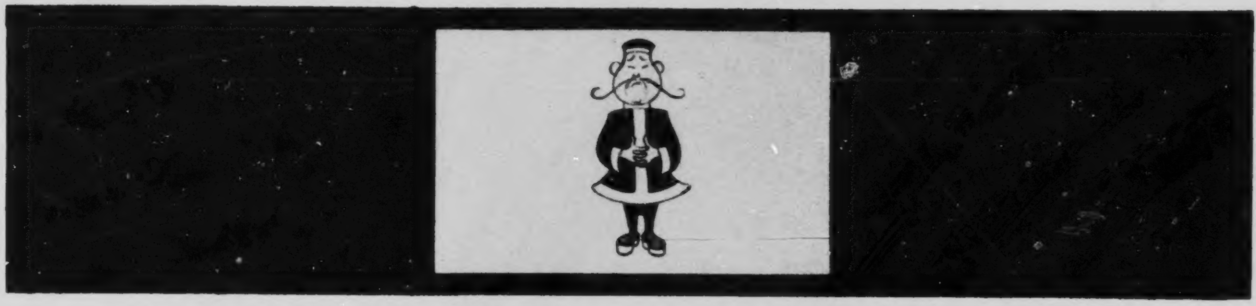




ONCE, MANY MANY YEARS AGO, THERE WAS A FAMOUS MAN WHO WAS NOTED FOR HIS SAGE ADVICE.




A PICTURE
IS WORTH A THOUSAND WORDS!
AUDIO * VISUAL * SECTION * TRAINING * RESEARCH * AND * DEVELOPMENT * STATION



AND FOR MANY YEARS A FEW PEOPLE LISTENED ALTHOUGH FEW ACTED...

AND THEN...SUDDENLY...

EVERYONE ACTED. BUT INSTEAD OF HELPING TO SOLVE PROBLEMS ... THIS RUSH INTO AUDIO VISUAL HAS CREATED THEM. PEOPLE NOW HAVE ALL THIS HARDWARE BUT ... IT ISN'T ENOUGH.

THEY NEED THE SOFTWARE ... SUPPORTIVE MATERIALS, THE FILMS, TAPES, SLIDES. THESE MATERIALS ARE USUALLY GROUPED UNDER THE HEADING OF SOFTWARE ON TODAY'S MARKET BUT IT NEVER SEEMS TO BE QUITE RELEVANT.

PRODUCING THE SOFTWARE LOCALLY, WITH THE AID OF KITS AND TRAINING COURSES, DOESN'T WORK TOO WELL EITHER.

BECAUSE MOST EDUCATORS AND TRAINERS JUST DON'T HAVE THE TIME.

AND WHEN THEY DO HAVE THE TIME, THE SHOWS THEY PRODUCE MAY NOT FULLY CAPTURE THE STUDENT'S ATTENTION.

ON THE OTHER HAND, THE MATERIAL PRODUCED BY AV SPECIALISTS MAY HAVE A MORE PROFESSIONAL LOOK, IT MAY HOLD THEIR INTEREST --- BUT

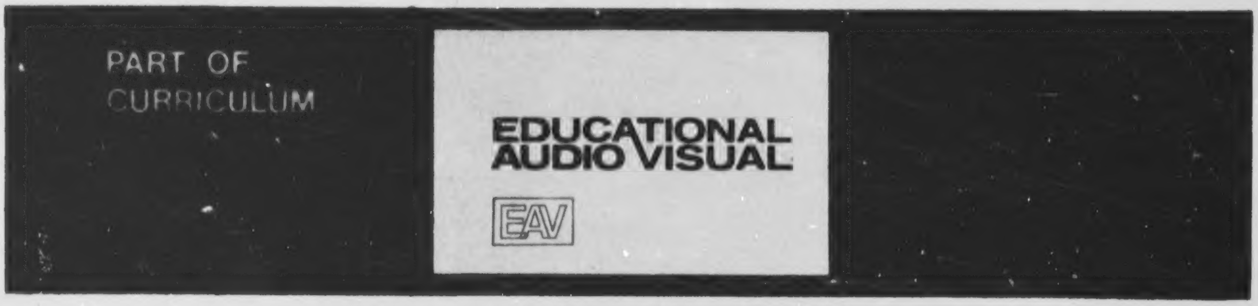
EXAMINATION RESULTS
ENGLISH 58
MATHEMATICS 52
SOCIAL STUDIES 61

IT MAY NOT TEACH.

EDUCATIONAL AUDIO VISUAL

EAV

WHAT IS NEEDED IS A PLANNING SYSTEM THAT WOULD ASSURE AN EFFICIENT BLEND OF THE INSTRUCTIONAL AND AUDIO VISUAL SKILLS IN THE DESIGN AND PRODUCTION OF THE SOFTWARE.

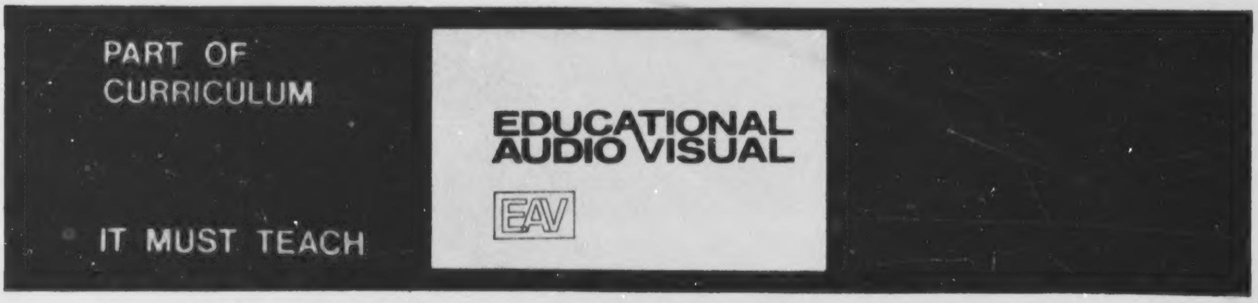


PART OF CURRICULUM

EDUCATIONAL AUDIO VISUAL

EAV

FIRST ... IT MUST BE AN INTEGRAL PART OF THE PROGRAM ... NOT JUST A (NICE TO HAVE) "ADD-ON".



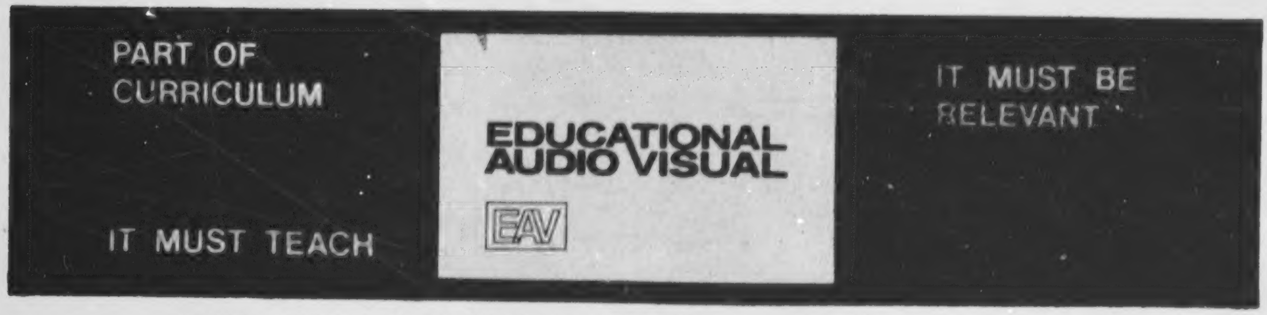
PART OF CURRICULUM

IT MUST TEACH

EDUCATIONAL AUDIO VISUAL

EAV

SECOND, IT MUST TEACH ... AND WE MUST KNOW THAT IT TEACHES ... THEREFORE IT MUST BE BASED ON TESTABLE OBJECTIVES.



PART OF CURRICULUM

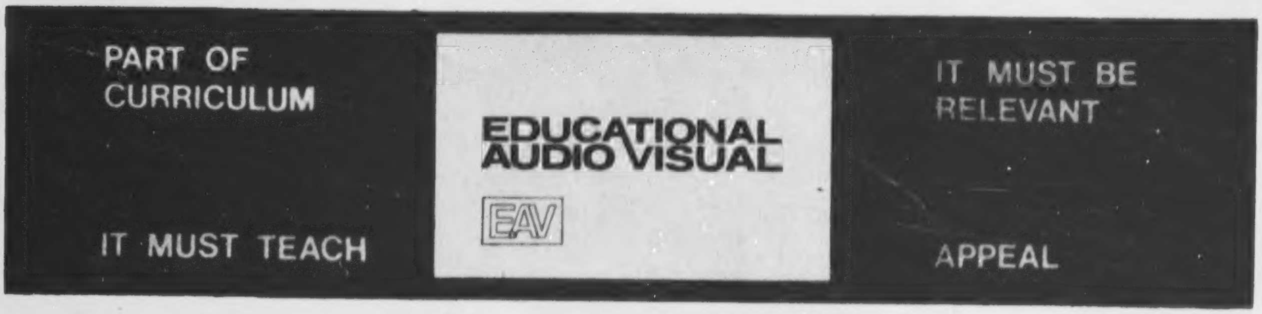
EDUCATIONAL AUDIO VISUAL

EAV

IT MUST BE RELEVANT

IT MUST TEACH

THIRD, IT MUST BE RELEVANT TO THE STUDENT'S NEEDS ... THIS MAY ENTAIL LOCALIZING SOME OF THE INSTRUCTIONAL COMPONENTS.



PART OF CURRICULUM

EDUCATIONAL AUDIO VISUAL

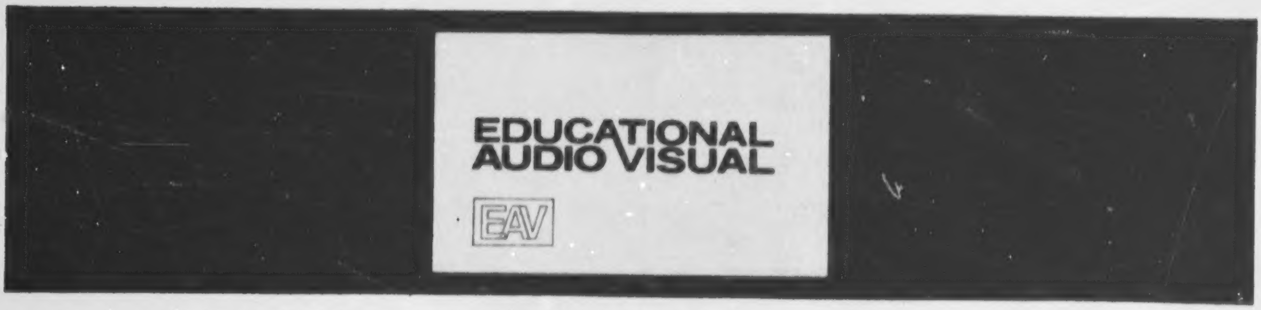
EAV

IT MUST BE RELEVANT

IT MUST TEACH

APPEAL

AND FOURTH ... IT MUST BE APPEALING ... IF WE CAN'T KEEP THEIR INTEREST AND CREATE A DESIRE TO LEARN, THE WHOLE PROGRAM WILL BE LOST.

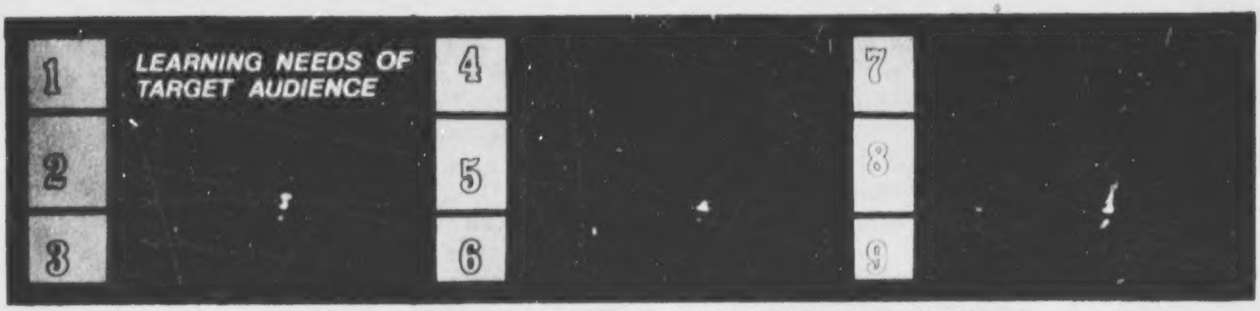


EDUCATIONAL AUDIO VISUAL

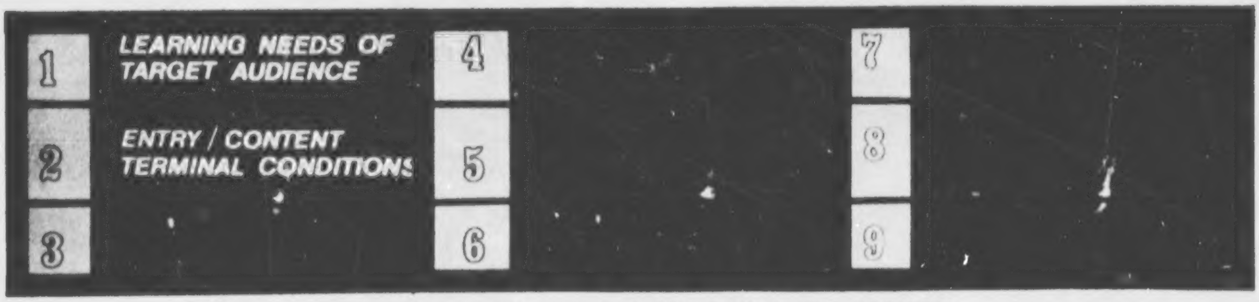
EAV

THE PLANNING SYSTEM WE ARE GOING TO DISCUSS

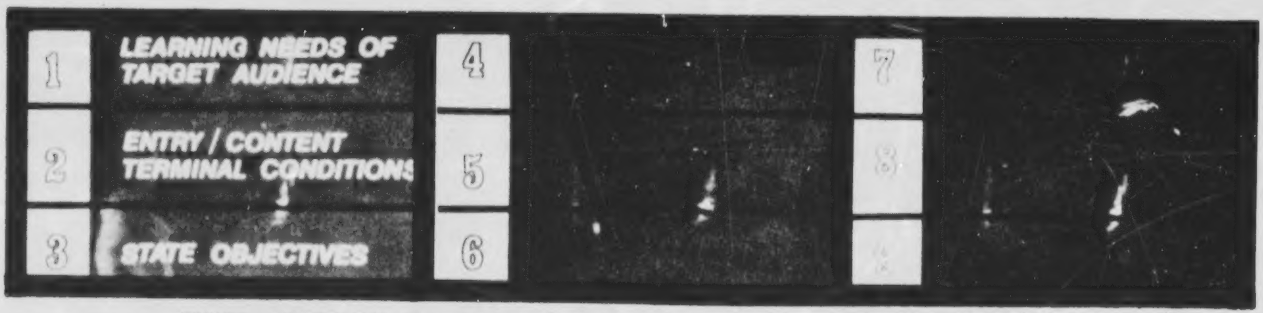
REQUIRES ONLY 9 STEPS. AND TO KEEP EVERYONE THINKING ALONG THE SAME LINE, LET'S ASSUME THAT WE ARE GOING TO INVESTIGATE THE MEDIATION REQUIRED IN A PORTION OF THE MATHEMATICS CURRICULUM FOR ADULT REFRESHER TRAINING.


1
LEARNING NEEDS OF TARGET AUDIENCE
2
3
4
5
6
7
8
9

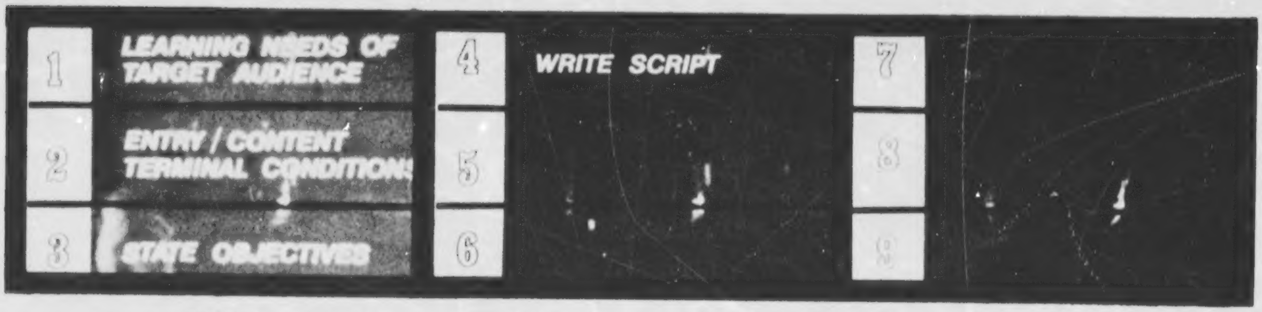
FIRST, THE EDUCATIONAL OR TRAINING SPECIALISTS MAKE AN "IN-DEPTH" STUDY OF THE NEEDS OF THE TARGET AUDIENCE TO DISCERN WHICH LESSONS NEED MEDIATION.


1
LEARNING NEEDS OF TARGET AUDIENCE
2
ENTRY / CONTENT TERMINAL CONDITIONS
3
4
5
6
7
8
9

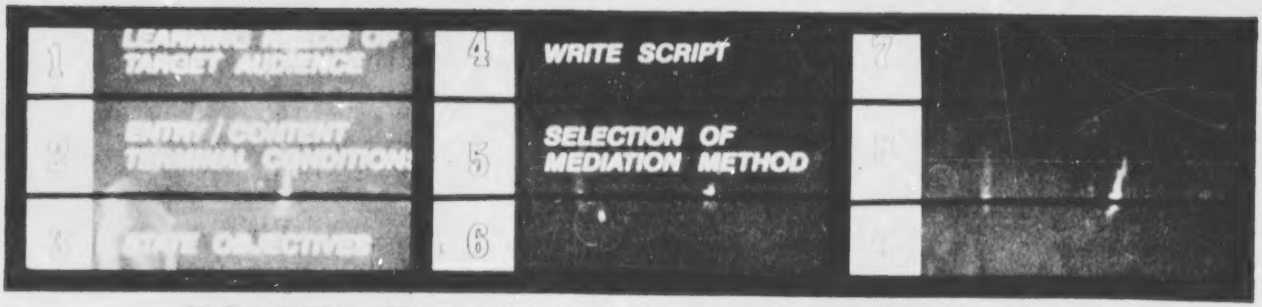
SECOND, WE HAVE TO ESTABLISH WHAT ENTRY SKILLS THE STUDENTS HAVE WHEN THEY START THE LESSON AND WHAT SKILLS THEY SHOULD HAVE WHEN THEY FINISH.


1
LEARNING NEEDS OF TARGET AUDIENCE
2
ENTRY / CONTENT TERMINAL CONDITIONS
3
STATE OBJECTIVES
4
5
6
7
8

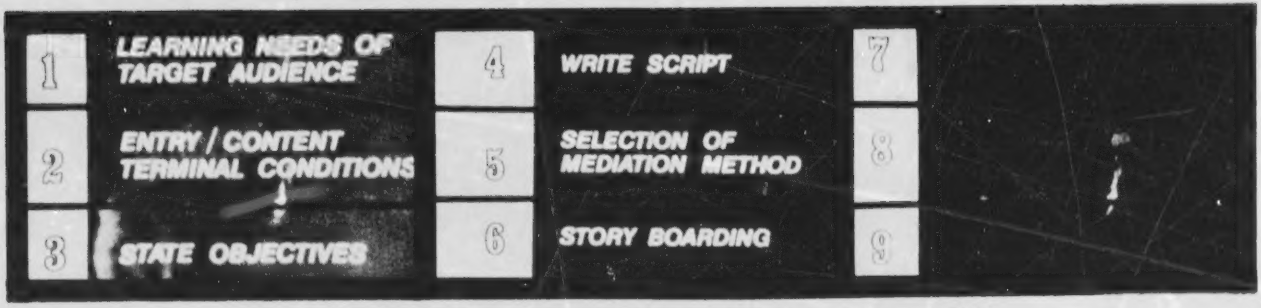
THIRD, ESTABLISH THE INSTRUCTIONAL OBJECTIVES FOR THIS MEDIATED SECTION. FOR EXAMPLE, GIVEN ALL PERTINENT DATA, THE STUDENT WILL ... AND SO FORTH.


1
LEARNING NEEDS OF TARGET AUDIENCE
2
ENTRY / CONTENT TERMINAL CONDITIONS
3
STATE OBJECTIVES
4
WRITE SCRIPT
5
6
7
8

FOURTH ... WRITE THE SCRIPT FOR THE MEDIATED SECTION.


1
LEARNING NEEDS OF TARGET AUDIENCE
2
ENTRY / CONTENT TERMINAL CONDITIONS
3
STATE OBJECTIVES
4
WRITE SCRIPT
5
SELECTION OF MEDIATION METHOD
6
7

IN THE FIFTH STEP, WE HAVE TO SELECT THE METHOD OF MEDIATION. IS MOTION ESSENTIAL? ARE STILLS MORE APPROPRIATE? WHAT FACILITIES ARE AVAILABLE TO OUR TARGET AUDIENCE? THIS DECISION GOVERNS THE STORYBOARD PROCESS THAT TAKES PLACE IN STEP 6.



1 LEARNING NEEDS OF TARGET AUDIENCE

2 ENTRY / CONTENT TERMINAL CONDITIONS

3 STATE OBJECTIVES

4 WRITE SCRIPT

5 SELECTION OF MEDIATION METHOD

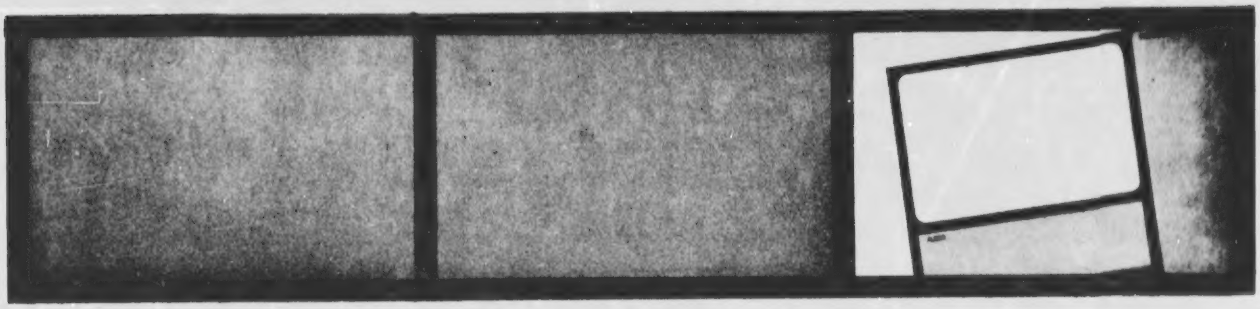
6 STORY BOARDING

7

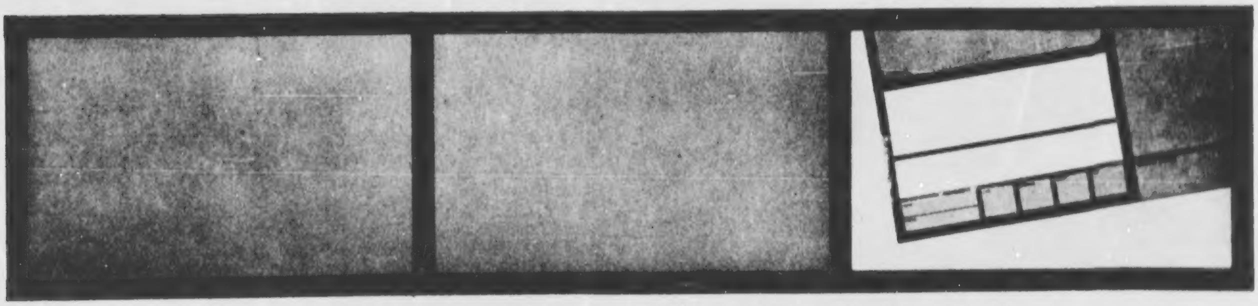
8

9

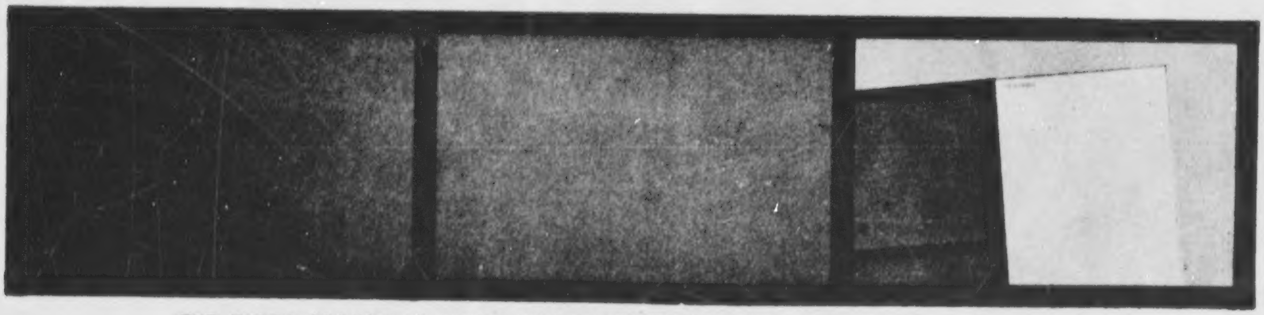
THE SIXTH STEP - THE SCRIPT IS HANDED OVER TO THE AUDIO VISUAL SECTION FOR STORYBOARDING. THIS IS THE MAJOR STEP IN THE PLANNING PROCESS BECAUSE DECISIONS CAN BE MADE HERE BEFORE THERE IS ANY MAJOR COMMITMENT OF FUNDS. STORYBOARDING INVOLVES THE USE OF



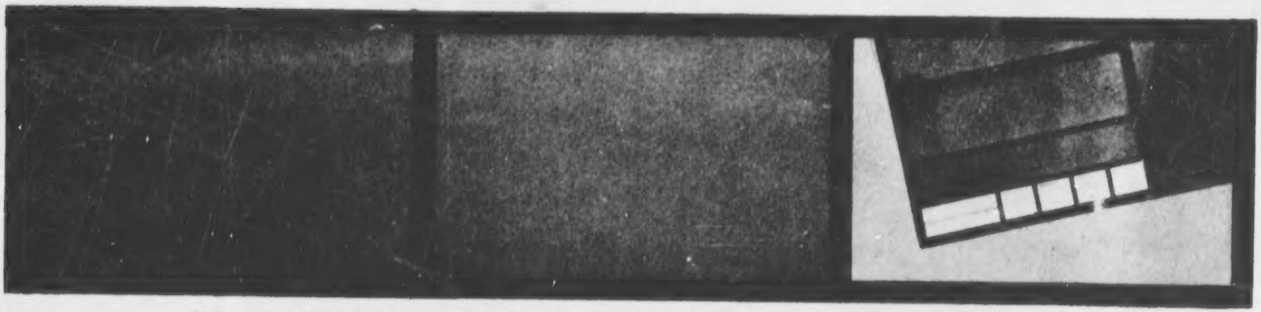
A FORM WITH A SPACE WHERE THE VISUAL INFORMATION CAN BE SKETCHED OUT.



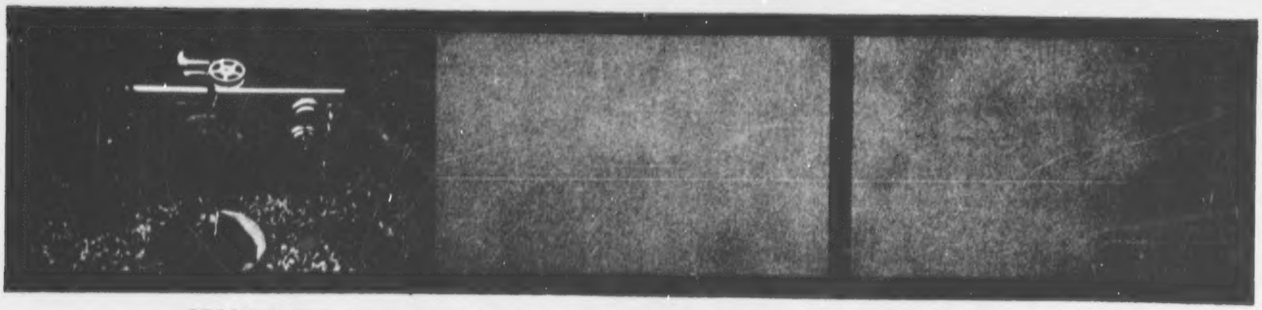
ANOTHER SPACE IS ALLOTTED FOR WRITING THE NARRATION AND LISTING SOUND EFFECTS.



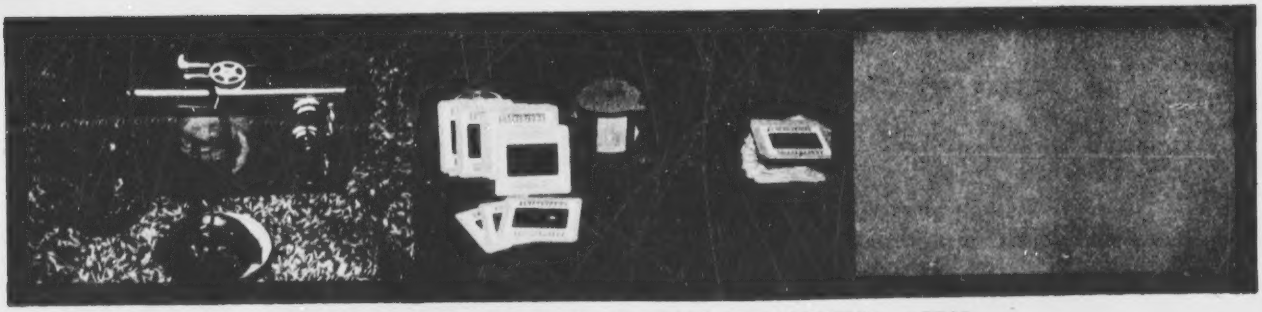
THE THIRD "REMARKS" SPACE MAY BE ADDED FOR SUCH THINGS AS LIGHTING EFFECTS, PROPS, TYPES OF COSTUME, ETC., BUT NOT EVERYONE USES IT.



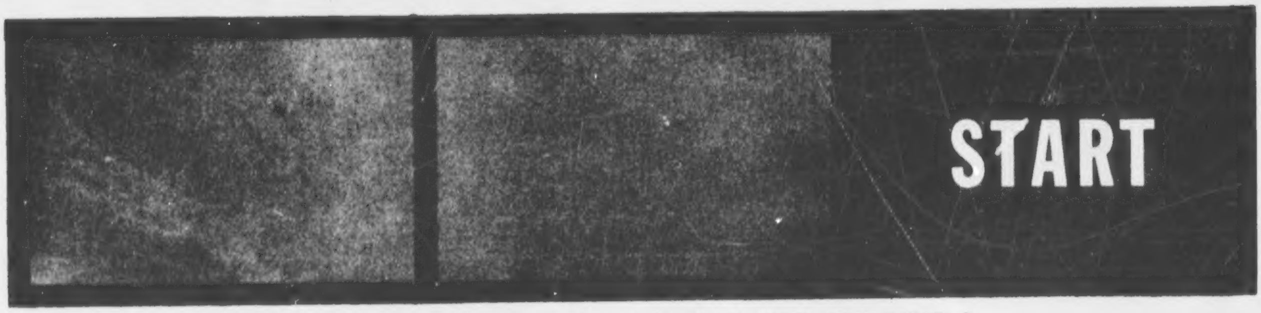
AND ADDED TO THESE THERE IS AN AREA USED BY THE PRODUCTION STAFF TO KEEP TRACK OF THE SHOOTING SCHEDULE.



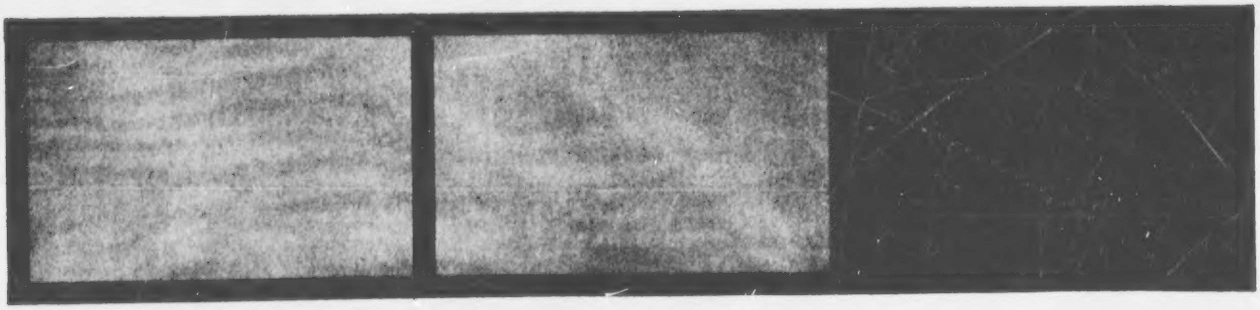
BECAUSE THE STORYBOARDING FOR A MOVIE OR TELEVISION PRODUCTION IS MORE COMPLEX



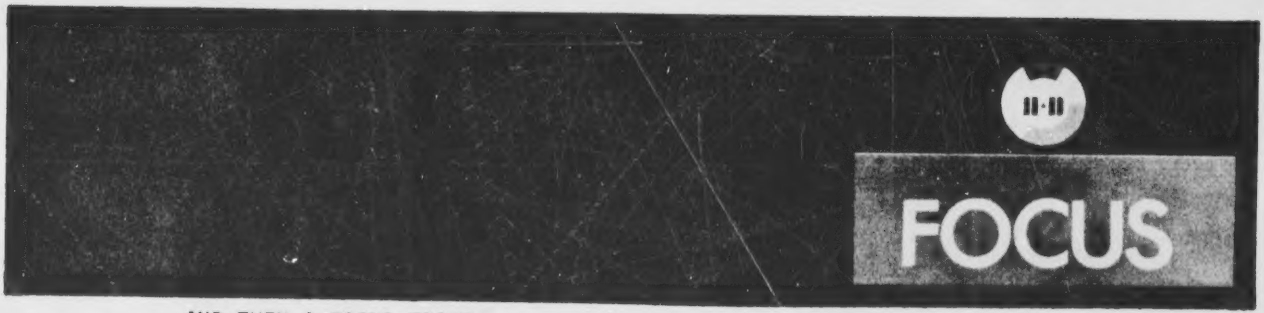
THAN THE STORYBOARDING FOR A SLIDE STORY OR FILMSTRIP, LET'S ASSUME THAT THE DECISION IN STEP 5 WAS TO PRODUCE FILMSTRIP.



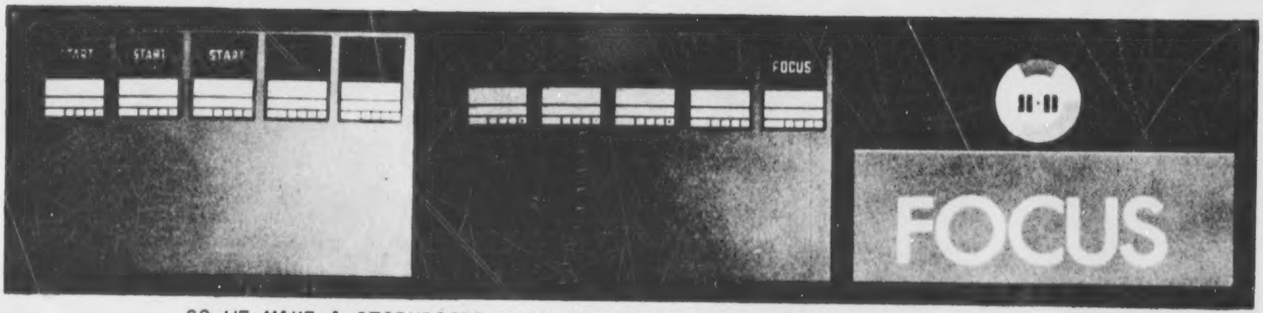
FOR TECHNICAL REASONS, ALL FILMSTRIPS BEGIN WITH THE FIRST 3 FRAMES LABELLED "START".



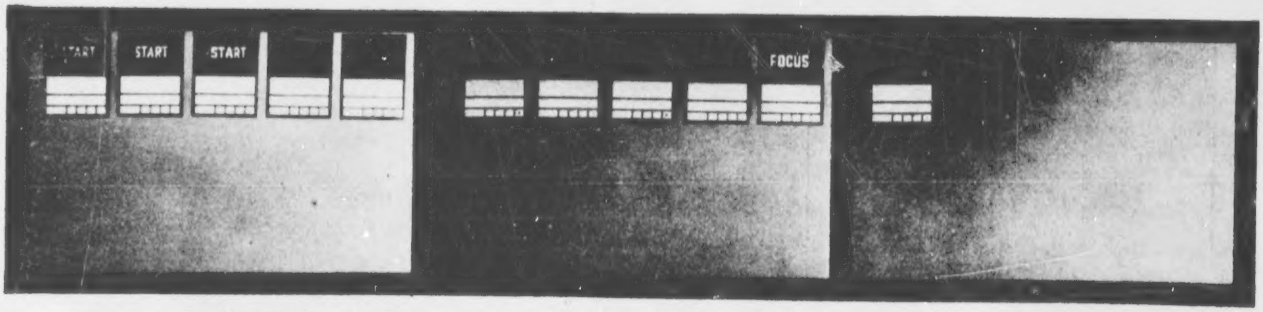
THEN, SIX BLANK FRAMES,



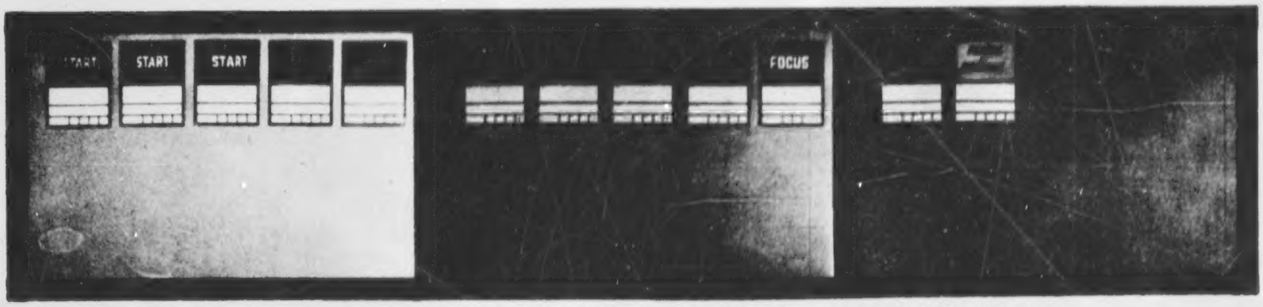
AND THEN A FOCUS FRAME.


START
START
START
FOCUS
FOCUS

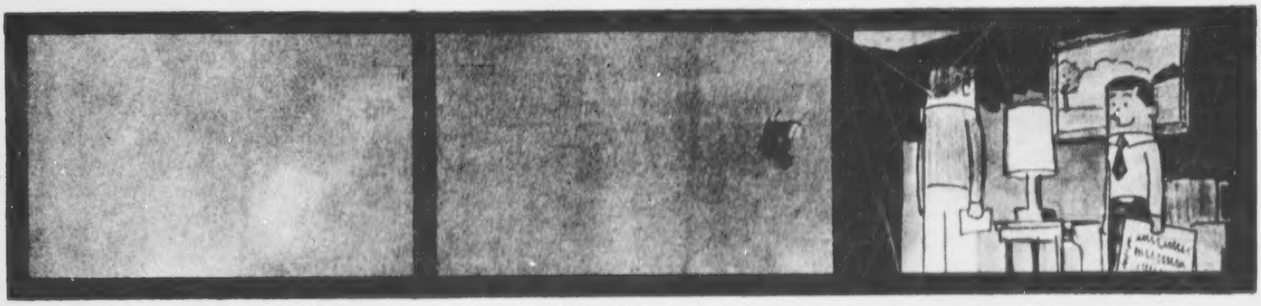
SO WE MAKE A STORYBOARD FORM FOR EACH ONE AND PIN THEM UP IN SEQUENCE.


START
START
START
FOCUS

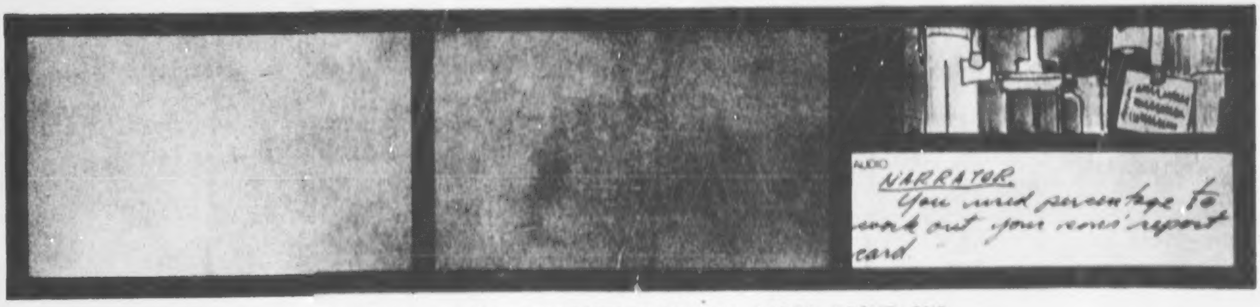
THERE IS ONE MORE BLANK SO THAT THE SUBJECT WILL NOT BE REVEALED UNTIL YOU ARE READY.



THE NEXT FRAME IS THE TITLE FRAME AND THERE IS A STORYBOARD FORM FOR IT. WE'LL START THIS FILMSTRIP BY REVIEWING A PREVIOUS LESSON WHERE WE USED PERCENTAGE TO CHECK A CHILD'S REPORT CARD.



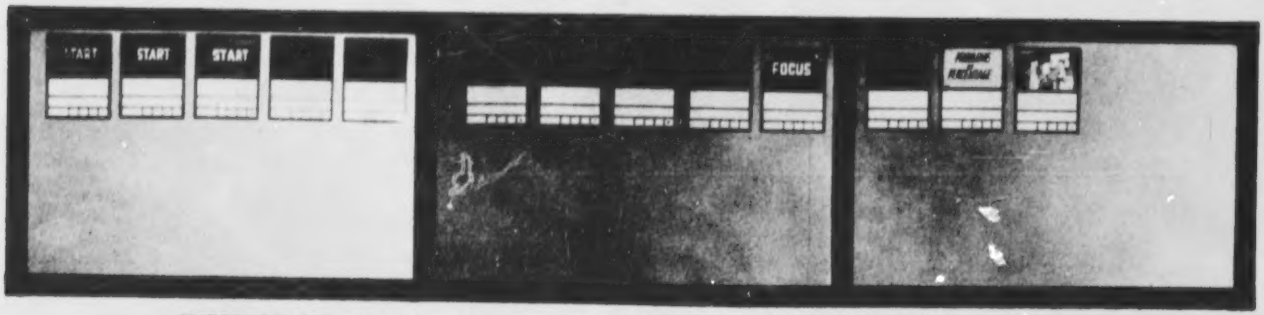
THE SKETCHES USED IN THE VISUAL AREA OF THE FORM SHOULD BE OF THE THUMBNAIL VARIETY BECAUSE, IN ALL PROBABILITY, THEY WILL BE CHANGED. THEY SHOULD BE CLEAR ENOUGH TO ESTABLISH THE INTENT BUT GREAT DETAIL IS NOT NECESSARY.



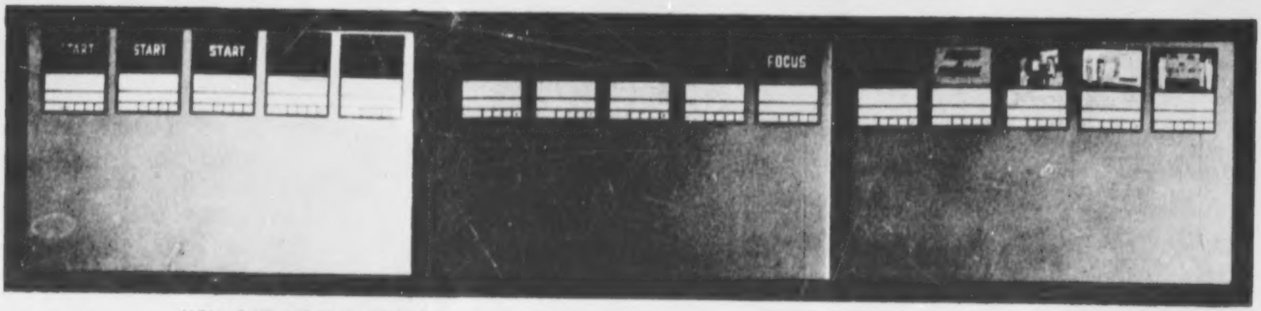
NARRATOR

You used percentage to work out your sons' report card

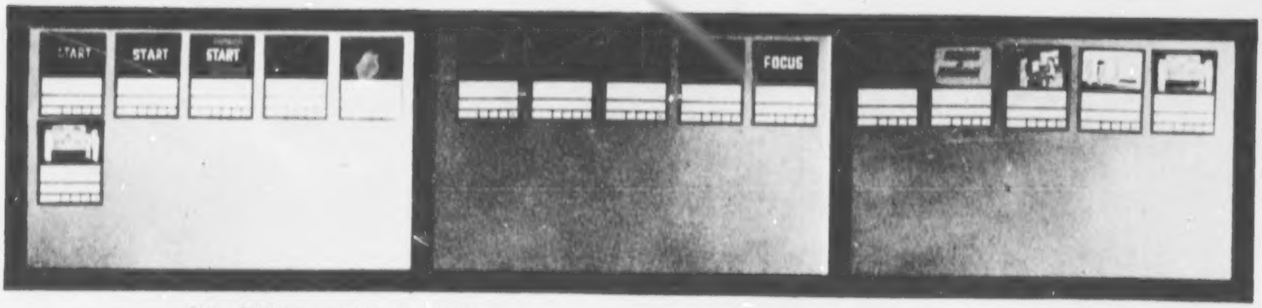
THE NARRATION TO BE USED IS WRITTEN IN THE AUDIO FRAME AND EVERY WORD WE INTEND TO SAY MUST BE SHOWN.


START
START
START
FOCUS

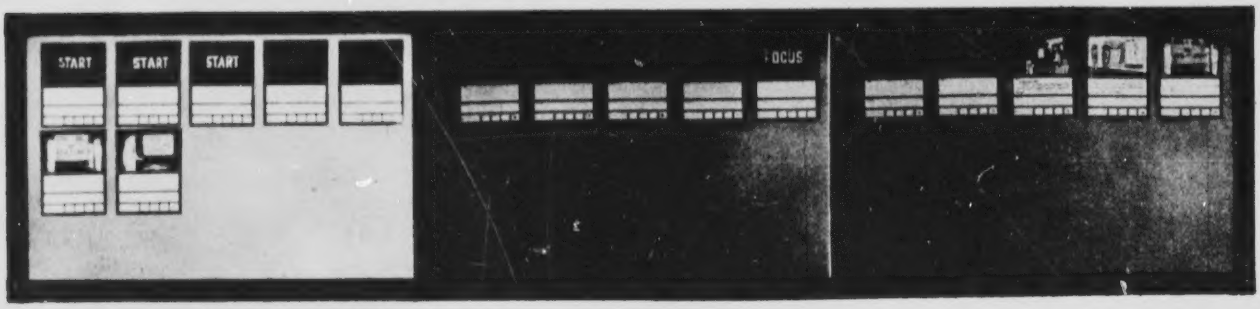
THERE IS ONE STORYBOARD FORM FOR EACH STEP IN THE REVIEW.


START
START
START
FOCUS

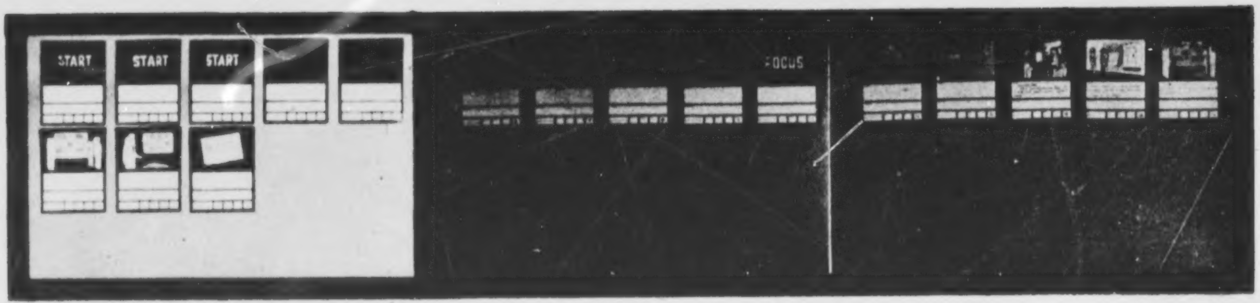
NOW OUR STORY STARTS,


START
START
START
FOCUS

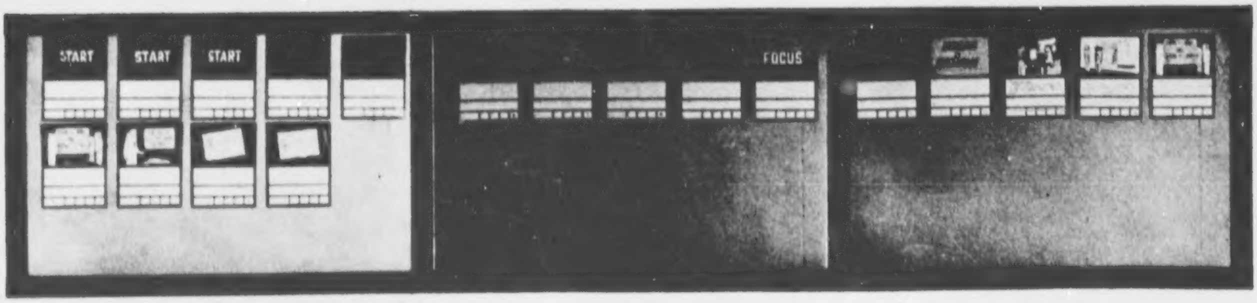
AND AGAIN THERE IS ONE


START
START
START
FOCUS

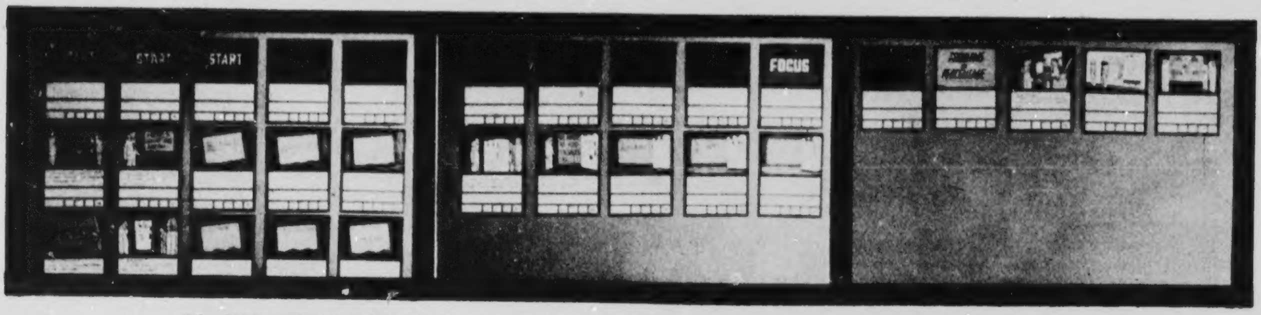
STORYBOARD FORM


START
START
START
FOCUS

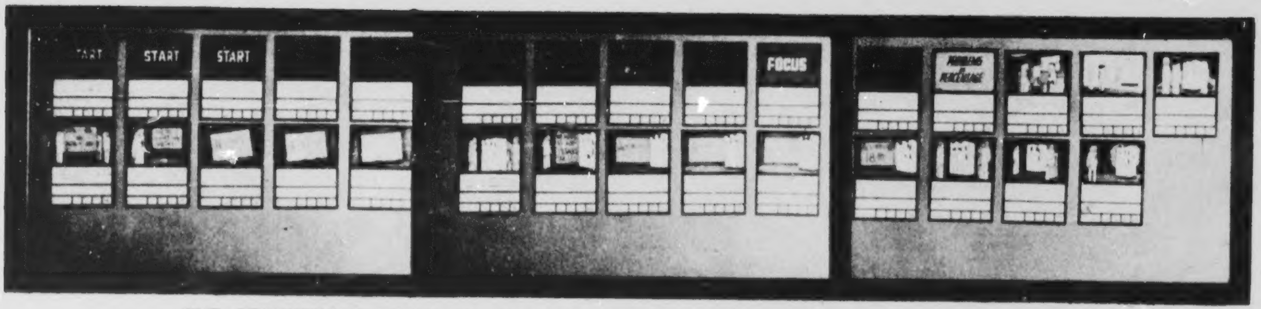
FOR EACH INSTRUCTIONAL


START
START
START
FOCUS

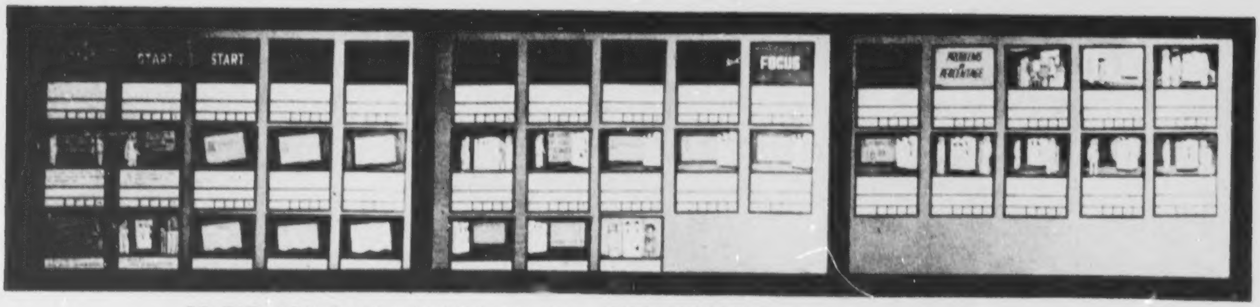
STEP IN THE LESSON.


START
START
FOCUS

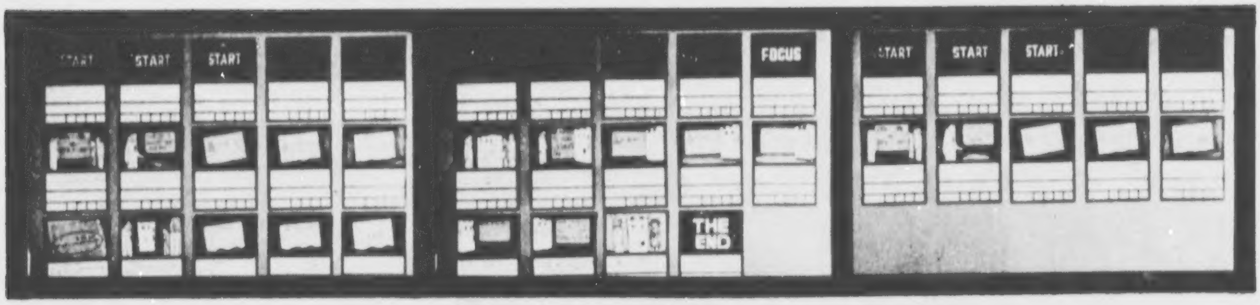
AS OUR STORY DEVELOPS, WE KEEP ADDING


START
START
START
FOCUS

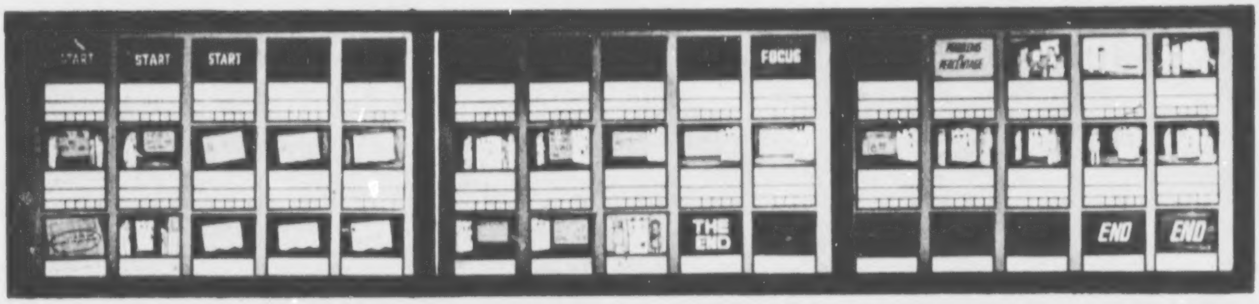
THE STORYBOARD FORMS TO THE SEQUENCE. EXAMINE EACH STEP CAREFULLY.


START
START
FOCUS

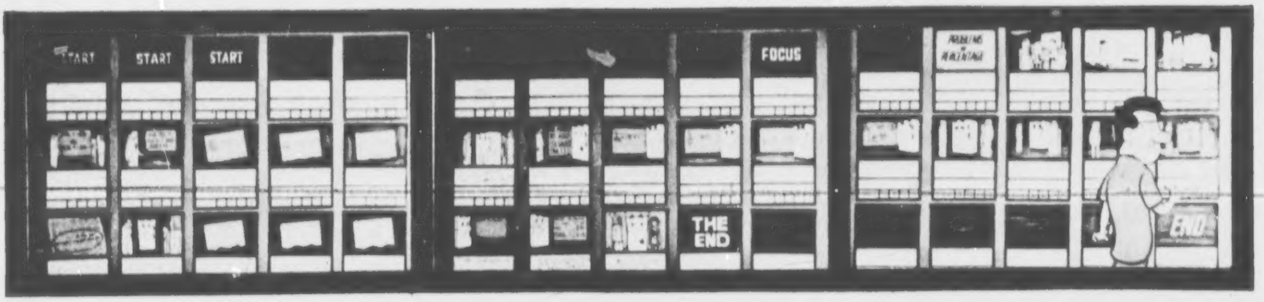
IS THE VISUAL NECESSARY FOR THE UNDERSTANDING OF THE LESSON? SHOULD IT BE ONE VISUAL, OR SEVERAL?


START
START
START
FOCUS
THE END
START
START
START

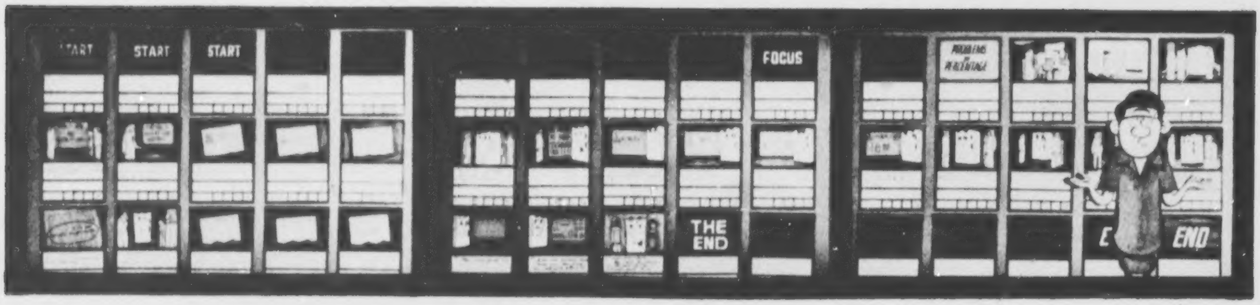
AND WHEN WE REACH THE END OF THE LESSON


START
START
START
FOCUS
THE END
END
END

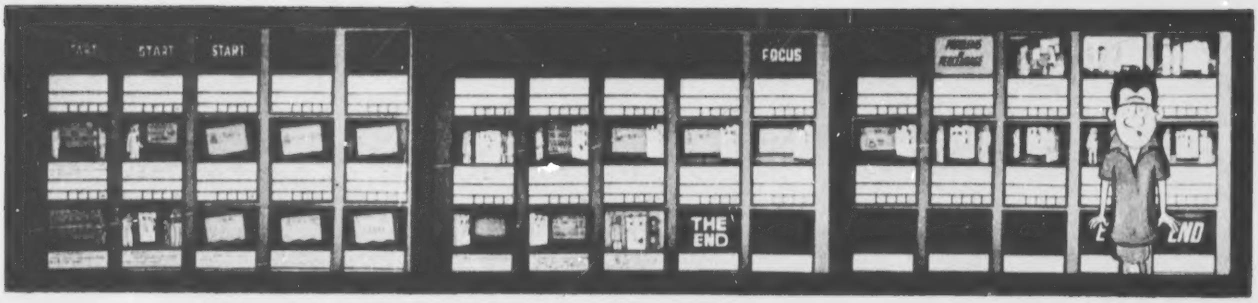
WE HAVE THE TECHNICAL REQUIREMENT OF 4 BLACK AND 2 END FRAMES.


START
START
START
FOCUS
THE END
END

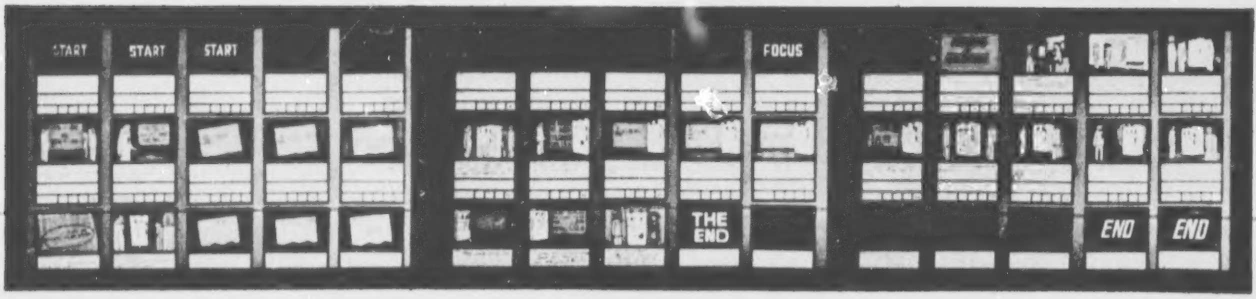
NOW,


START
START
START
FOCUS
THE END
END

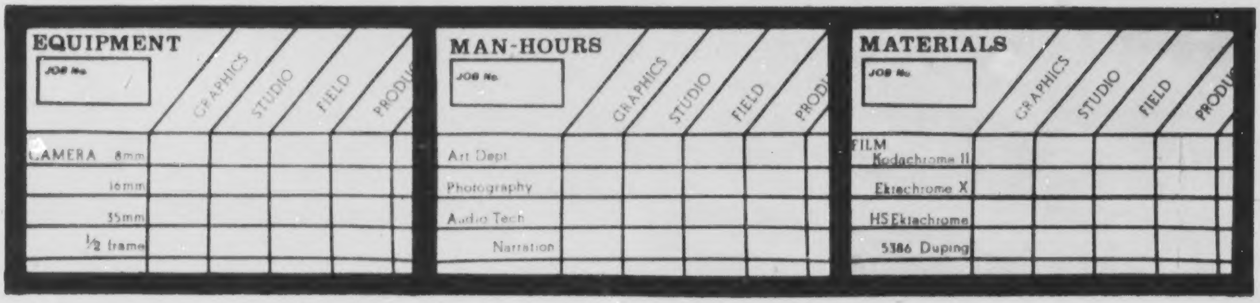
IT IS LEFT ALONE,


START
START
START
FOCUS
THE END
END

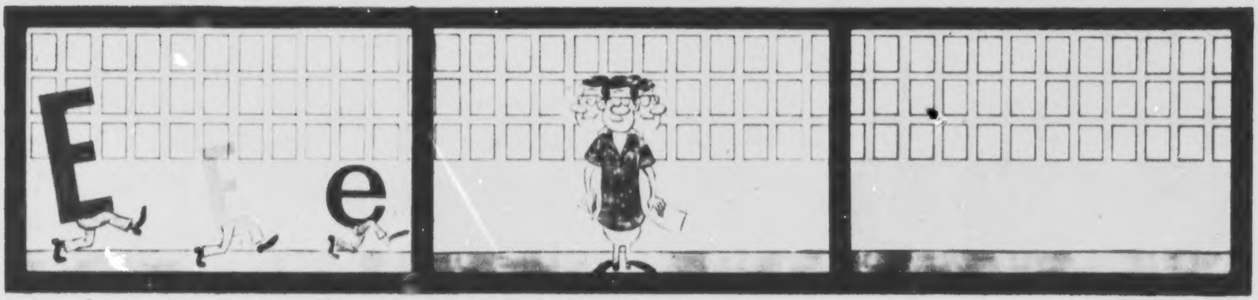
FOR AT LEAST 24 HOURS.


START
START
START
FOCUS
THE END
END
END

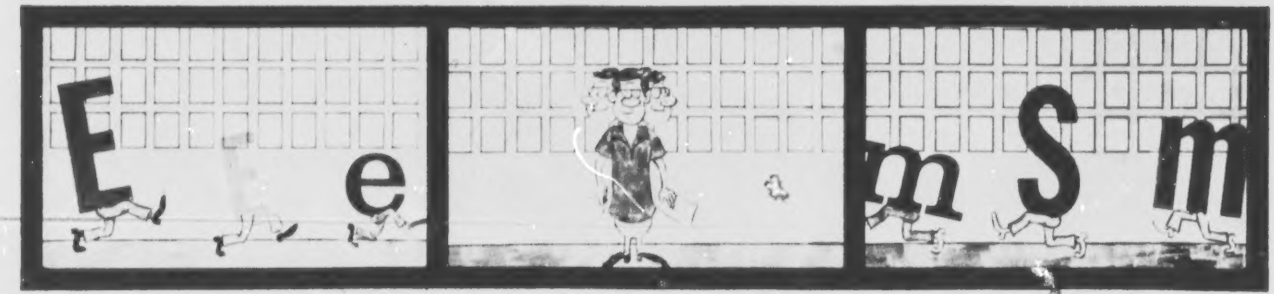
THEN IT IS REVIEWED TO SEE IF IT STILL TELLS THE STORY YOU INTENDED TO TELL.


EQUIPMENT
JOB No.
GRAPHICS
STUDIO
FIELD
PRODU
CAMERA 8mm
16mm
35mm
½ frame
MAN-HOURS
JOB No.
GRAPHICS
STUDIO
FIELD
PRODU
Art Dept
Photography
Audio Tech
Narration
MATERIALS
JOB No.
GRAPHICS
STUDIO
FIELD
PRODU
FILM
Kodachrome II
Ektachrome X
HS Ektachrome
5386 Duping

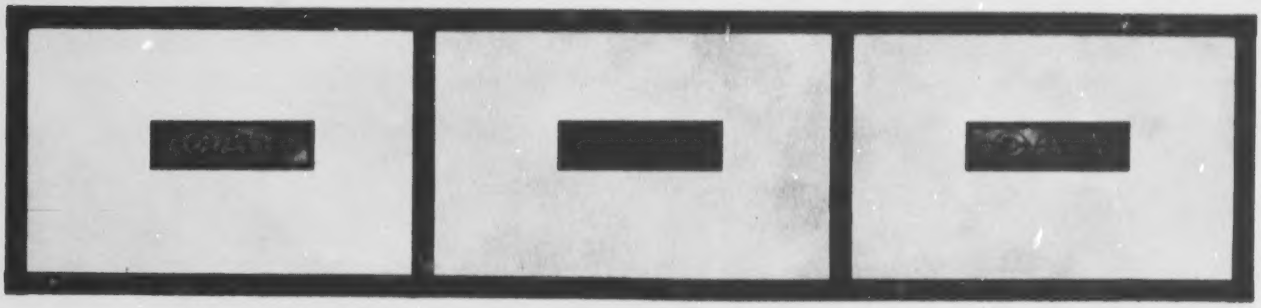
AT THIS STAGE, THE AV DEPARTMENT CAN MAKE AN INITIAL ESTIMATE ON THE MANHOURS, TECHNICAL COMPETENCIES AND MATERIALS REQUIRED TO MEDIATE THIS SCRIPT.



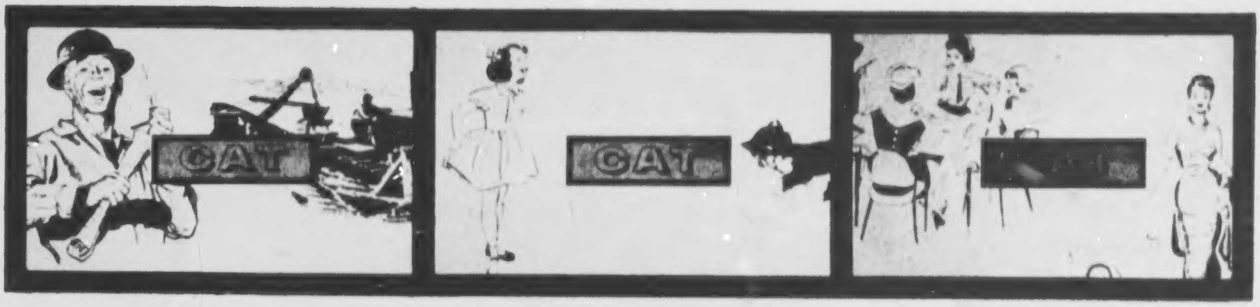
NOW THE EDUCATIONAL OR TRAINING SPECIALISTS ARE CALLED BACK IN ...

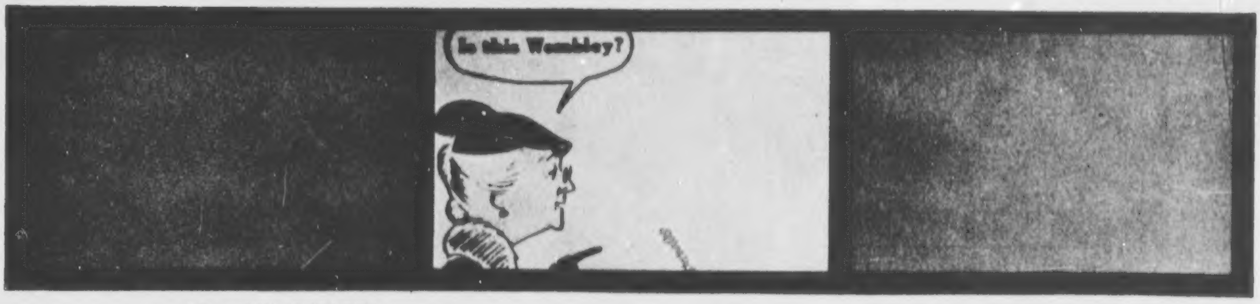


ALONG WITH THE SUPERVISORY OR MANAGEMENT PERSONNEL CONCERNED WITH THE PRODUCTION. WHEN THIS PRODUCTION WAS IN SCRIPT FORM, THERE WAS A DANGER IN THAT

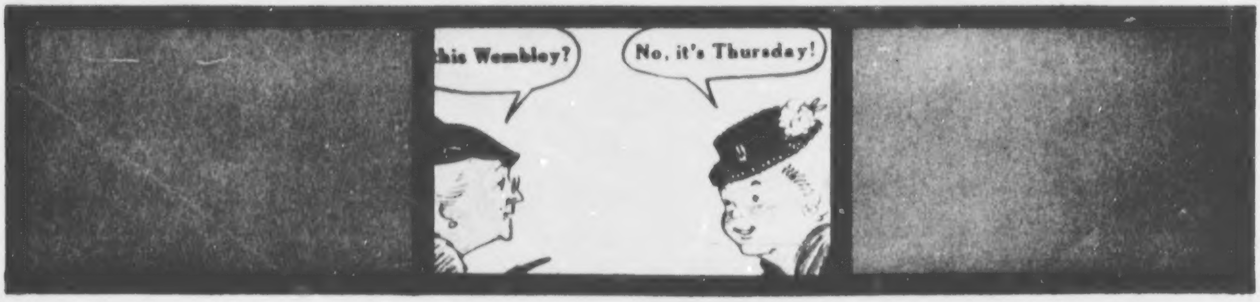


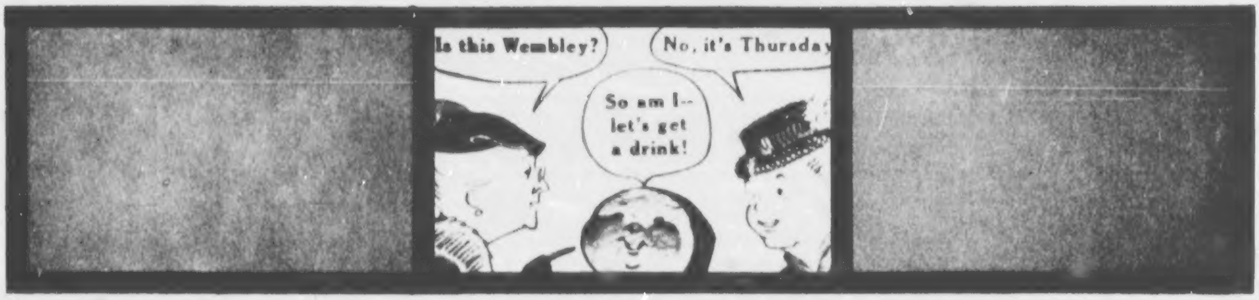
EACH PERSON READING IT COULD MISCONSTRUE EVEN SIMPLE WORDS;

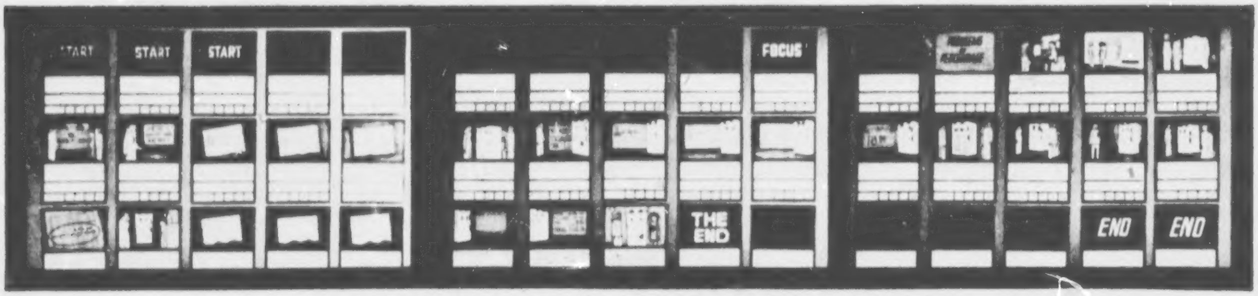



Is this Wembley?

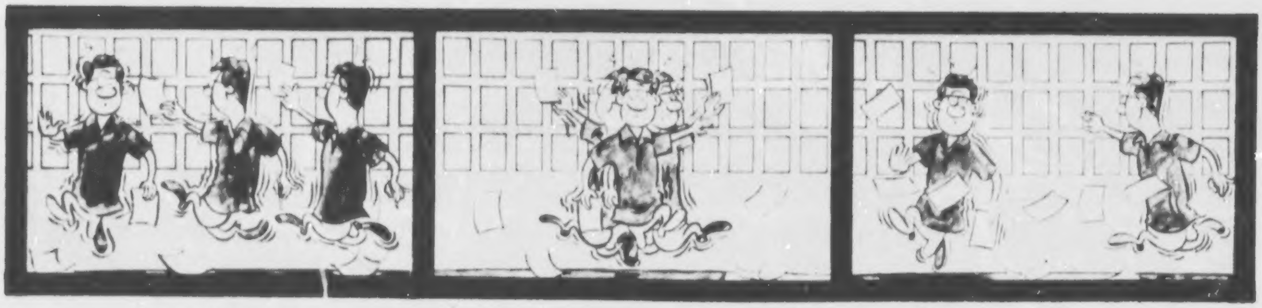
OR EVEN PHRASES.


this Wembley?
No, it's Thursday!

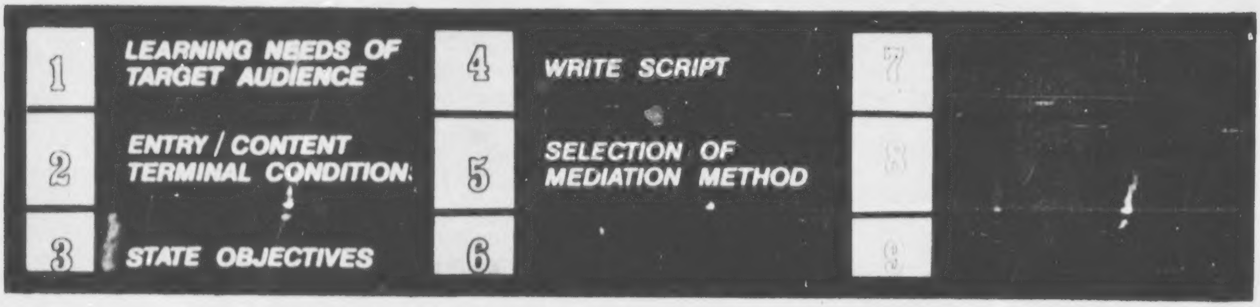

Is this Wembley?
No, it's Thursday
So am I-- let's get a drink!


START
START
START
FOCUS
THE END
END
END

BUT NOW THAT THE VIEWERS CAN SEE BOTH THE VISUALS AND THE NARRATION THE PRODUCER'S CONCEPT CAN BE SEEN AS A COMPLETE ENTITY.



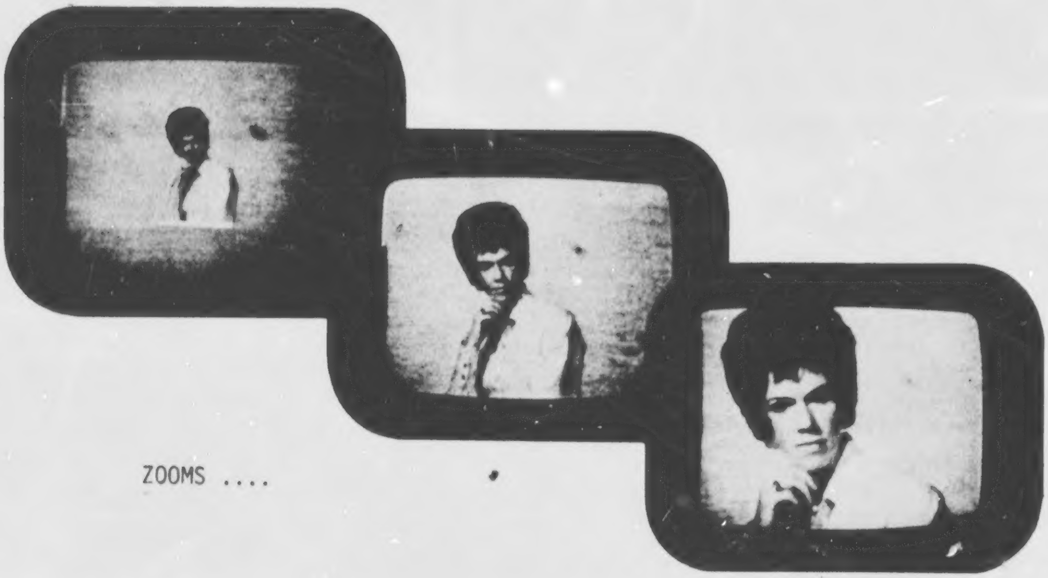
ALTERNATIVES CAN BE DISCUSSED, SEQUENCING EXAMINED AND CHANGES MADE. THE DESIGNER CAN SEE IF THE AV STAFF HAVE CAPTURED THE INTENT AND THE AV STAFF CAN EXPLAIN PRODUCTION TECHNIQUES AND LIMITATIONS.



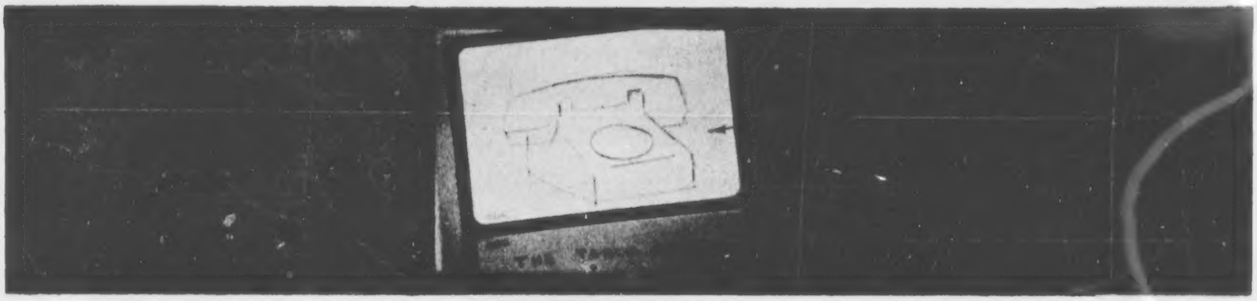
1 LEARNING NEEDS OF TARGET AUDIENCE
2 ENTRY / CONTENT TERMINAL CONDITIONS
3 STATE OBJECTIVES
4 WRITE SCRIPT
5 SELECTION OF MEDIATION METHOD
6
7
8
9

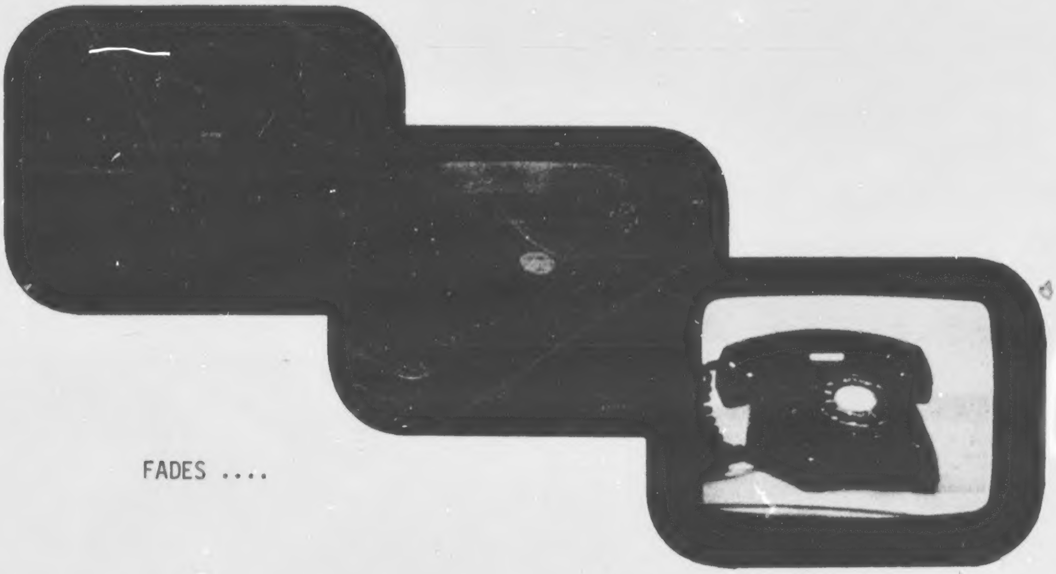
NEXT, BOTH MANAGEMENT AND THE DESIGNER SHOULD REVIEW THE DECISION MADE IN STEP 5. WAS THE STILL FORMAT THE RIGHT CHOICE? WOULD MOTION, IN ANY PART OR ALL OF THE PRODUCTION , BE MORE SATISFACTORY? IF THE DECISION IS MADE TO GO TO MOTION, OR EVEN PART MOTION, WE MUST RE-STORYBOARD THE SEQUENCE.

BECAUSE THE PLANNING FOR MOTION BRINGS IN OTHER VARIABLES, SUCH AS

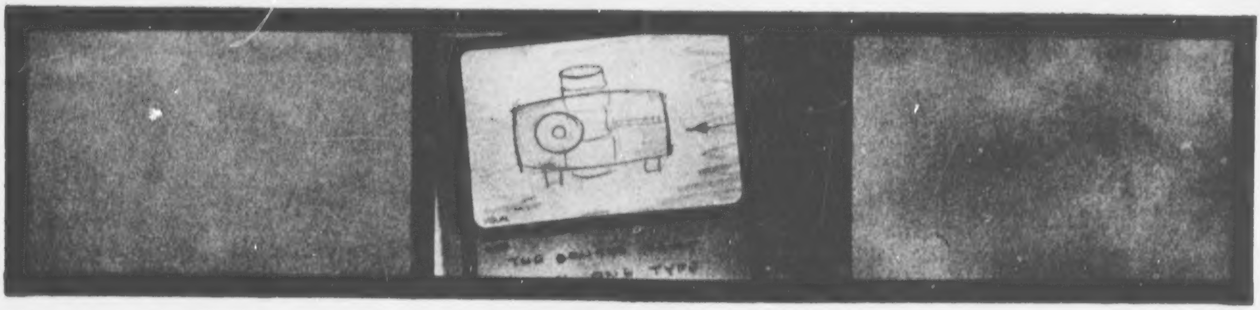


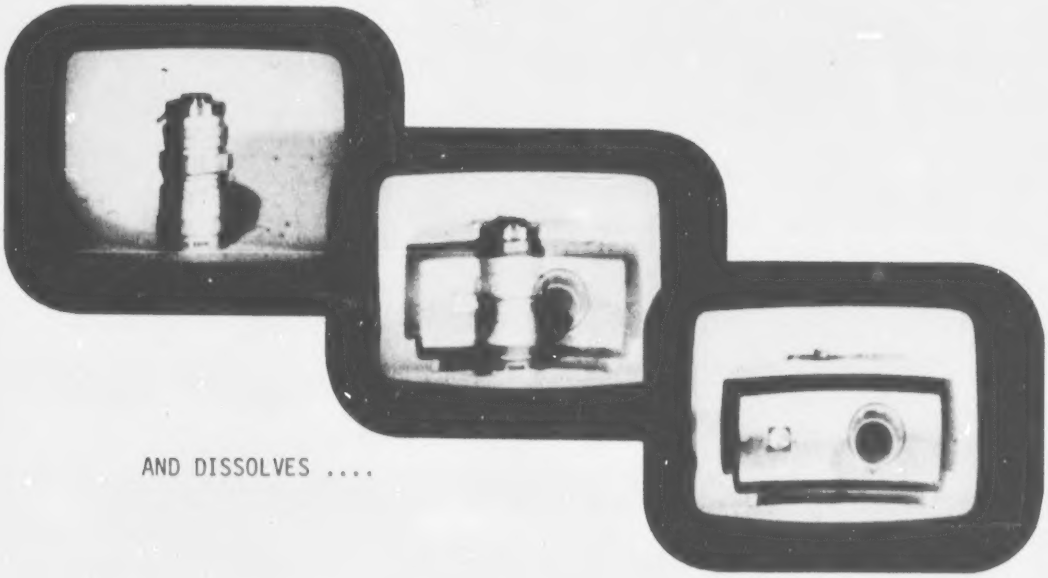
ZOOMS ....





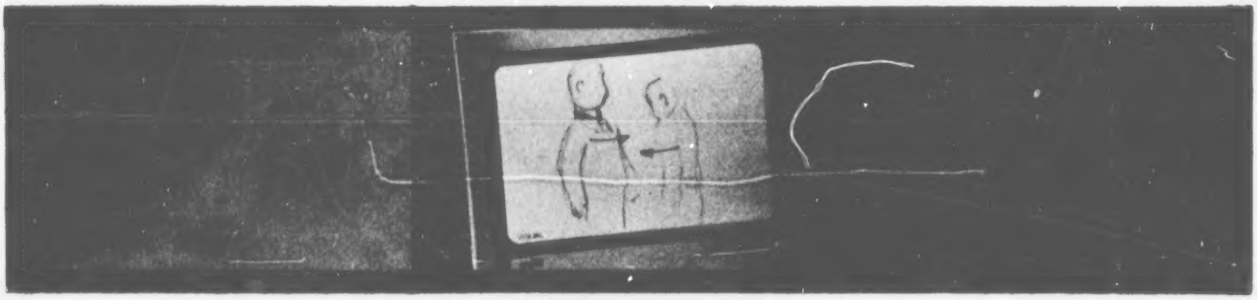
FADES ....



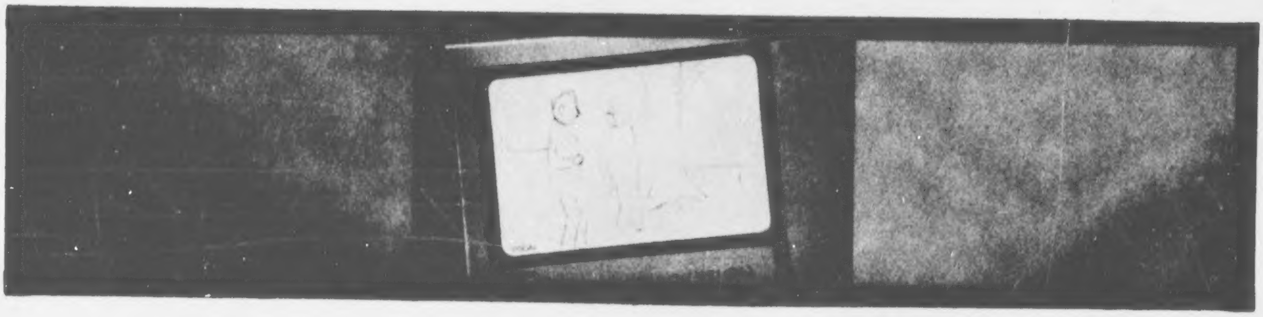


AND DISSOLVES ....

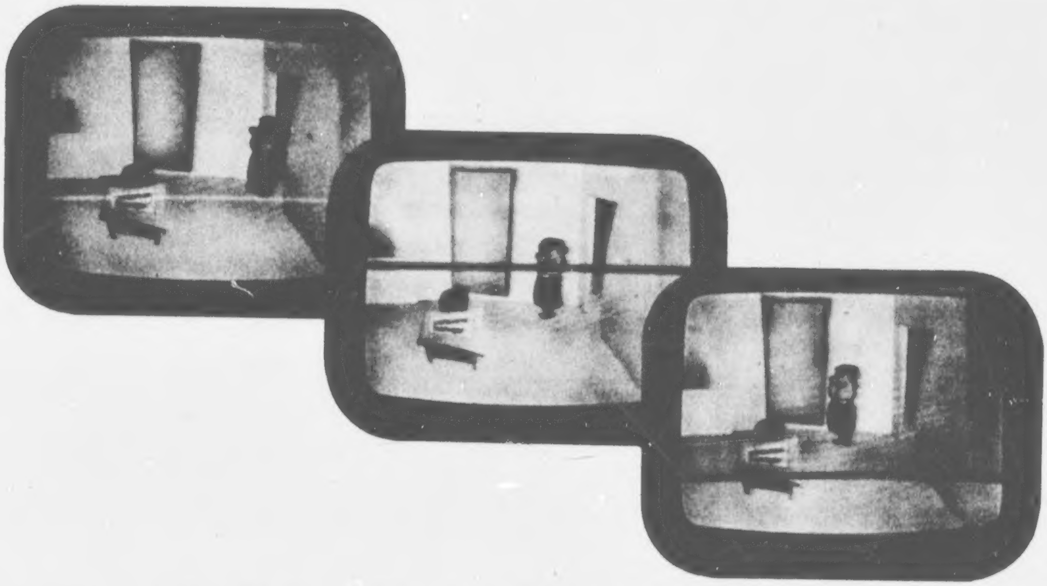
SPECIAL EFFECTS ....



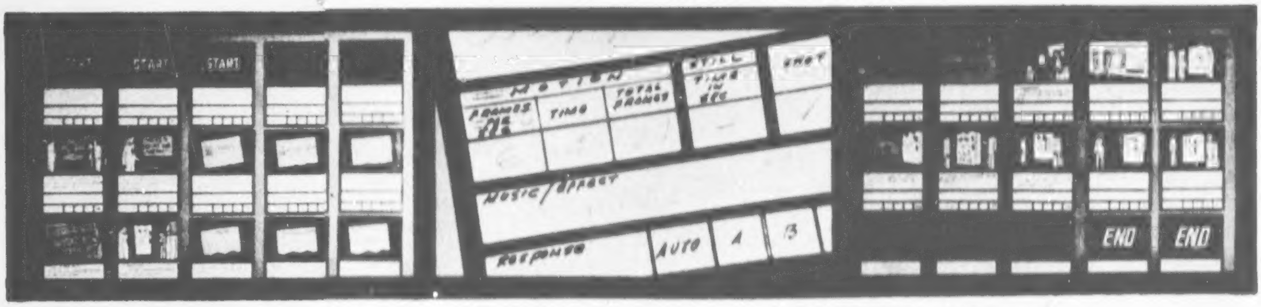
MOVEMENT OF ACTORS IN THE SCENE



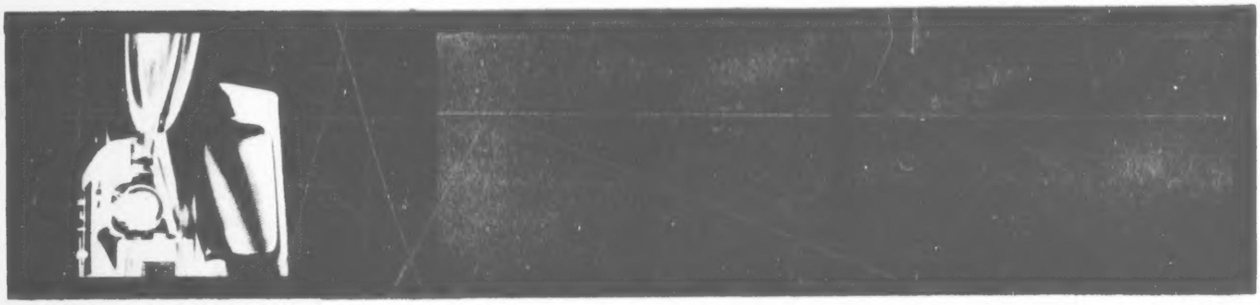
SHOOTING ON LOCATION.



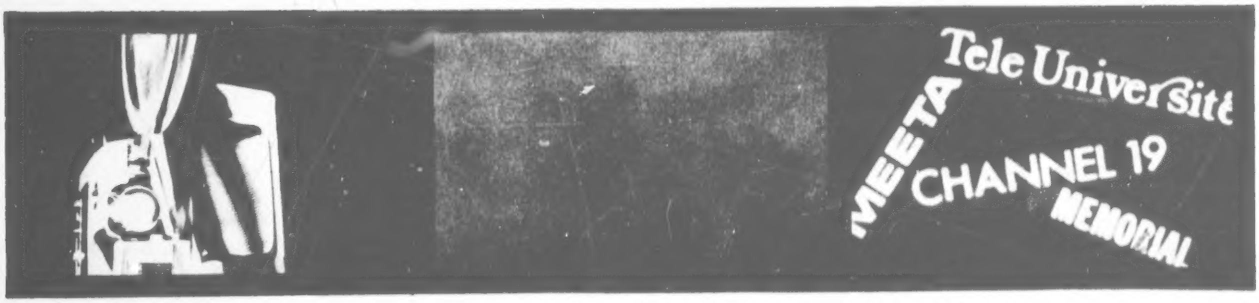
IF ANIMATION IS REQUIRED DOES THE COST OF ONE ARTIST MONTH PER MINUTE OF ANIMATION JUSTIFY THE EFFECT?


START
START
MOTION
STILL
SHOT
FRAMES
TIME
TOTAL FRAMES
TIME IN SEC
MUSIC/EFFECT
RESPONSE
AUTO
A
B
END
END

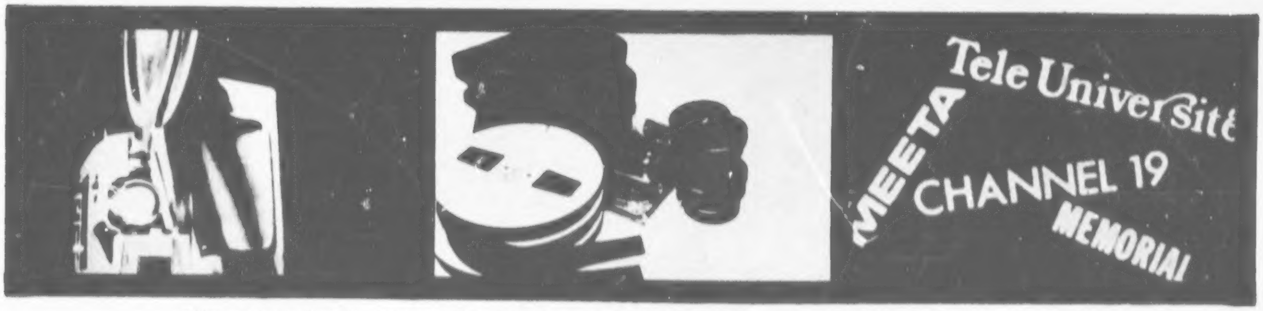
BUT EVEN THOUGH THE STORYBOARD FOR MOTION IS MORE COMPLEX AND TIME CONSUMING, MOTION SHOULD NOT BE AVOIDED IN THE OVERALL TRAINING PROGRAM.



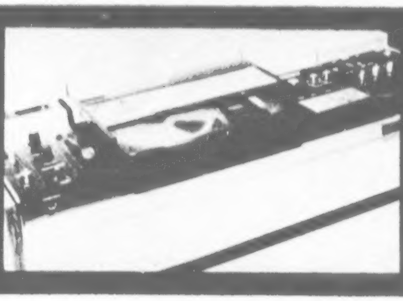
WE'VE HAD 16 MM EDUCATIONAL FILMS FOR SOME TIME,


Tele Université
MEETA
CHANNEL 19
MEMORIAL

AND, DEPENDING ON OUR LOCALE, WE'VE HAD EDUCATIONAL BROADCASTING FOR SOME TIME.


Tele Université
MEETA
CHANNEL 19
MEMORIAL

BUT THE IMPACT OF VIDEO TAPE RECORDING AND SUPER 8 FILM HAS OPENED NEW HORIZONS TO THE EDUCATIONAL PLANNER.



THE VIDEO CASSETTE IS IDEALLY SUITED TO SITUATIONS REQUIRING EXTENDED MOTION SEQUENCES AND, ALTHOUGH IT HAS ITS LIMITATIONS IN SOME AREAS, IT IS RAPIDLY BECOMING THE STANDARD TOOL FOR DISTRIBUTION. BUT - IF WE ARE GOING TO USE IT - WE HAVE TO BE CAREFUL ... BECAUSE

ALL
IN THE
FAMILY

The
Wonderful World
of
Disney

THROUGH YEARS OF EXPOSURE TO

THE TELEVISION SCREEN,

OUR TARGET AUDIENCES

this has been
a CBC
color
presentation

HAVE BECOME ACCOMPLISHED CRITICS.

REGARDLESS OF

ALL
IN THE
FAMILY

WHETHER THE PROGRAM

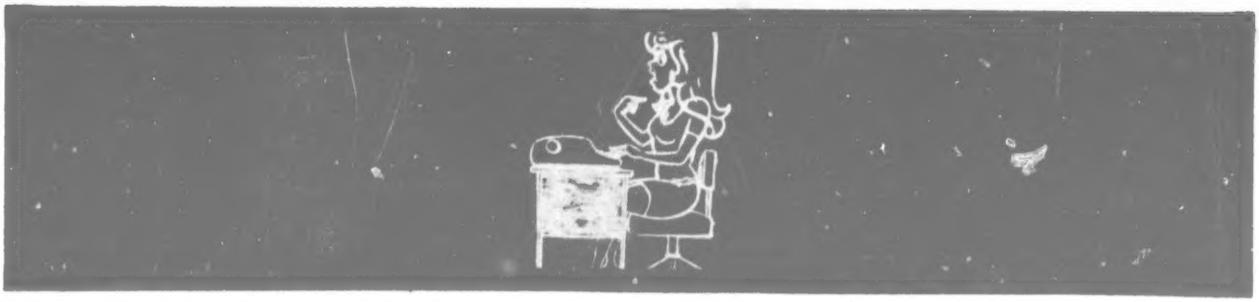
IS CBC, CTV,

OR IF IT'S A VIDEO TAPE TRAINING FILM.

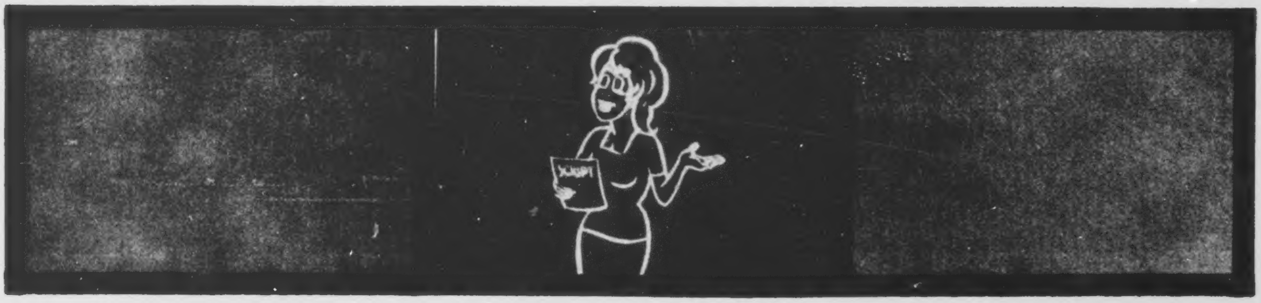
LISTENING
TECHNIQUES
Topic 2
Unit 1

THEY EXPECT TO SEE A PROFESSIONAL .....

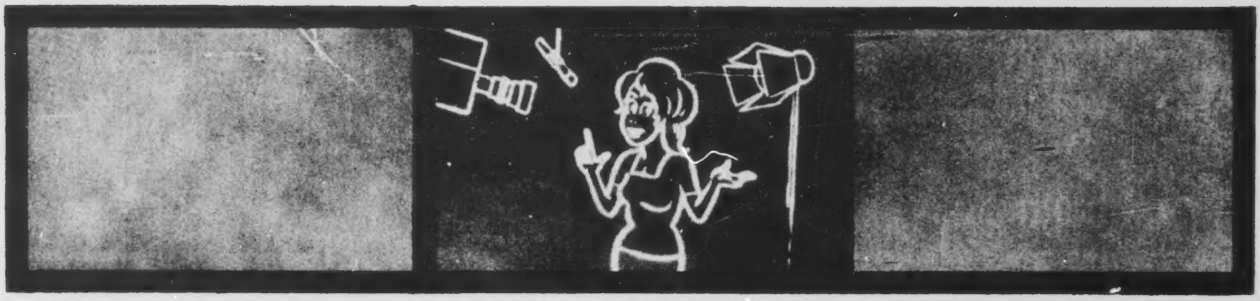
PRODUCTION.



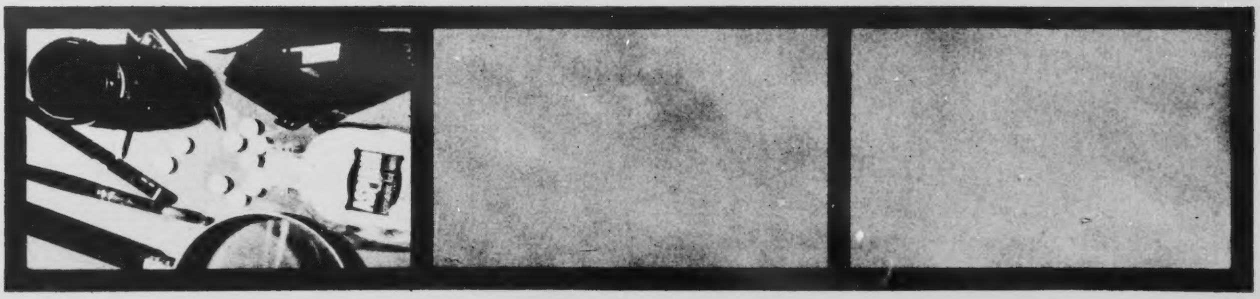
BECAUSE OF THIS, THE PAST PRACTICE OF USING OFFICE HELP AS ACTING TALENT



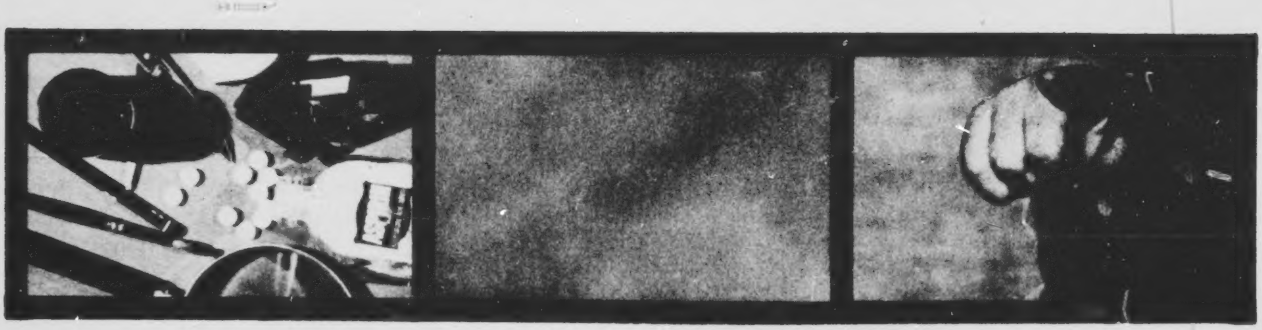
IS FINISHED. THE ACTING TALENT HAS TO BE GOOD.



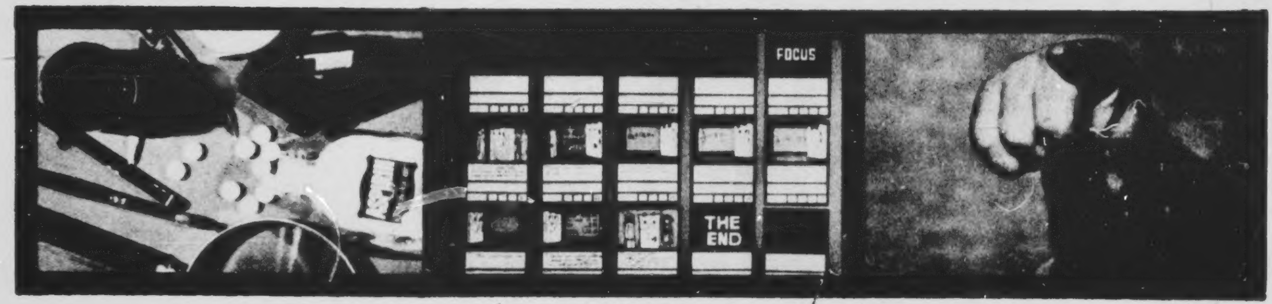
THEY HAVE TO BE PROFESSIONAL.



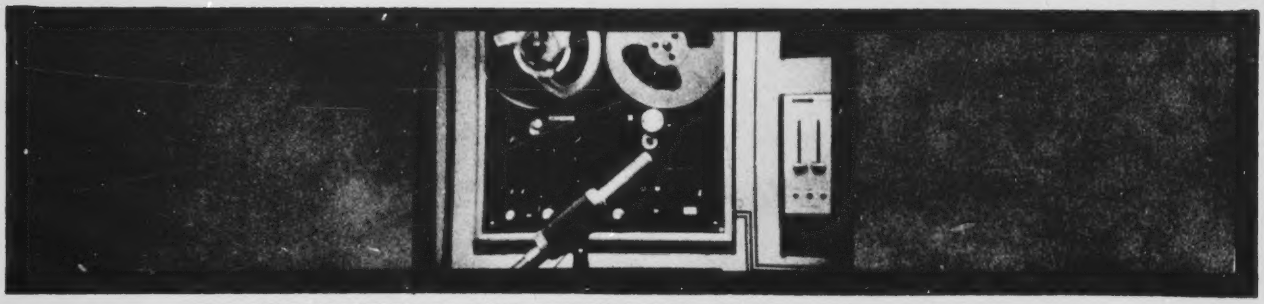
THERE CAN NOT BE ANY MORE PACKAGES PUT TOGETHER WITH A "THIS'LL HAVE TO DO" ATTITUDE.



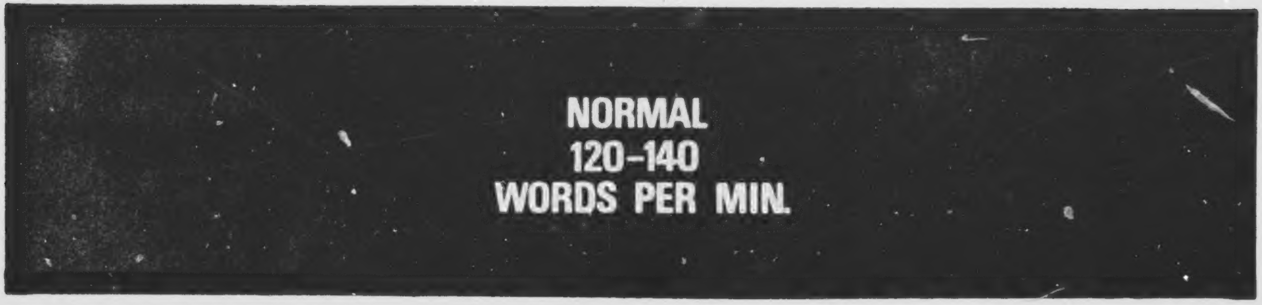
THE EDUCATIONAL SPECIALIST AND THE AUDIO VISUAL DESIGNER HAVE TO BE HELD ACCOUNTABLE FOR THEIR EFFORTS AND THIS



IS GOING TO MEAN STORYBOARDING OR PLANNING EVERY DETAIL.

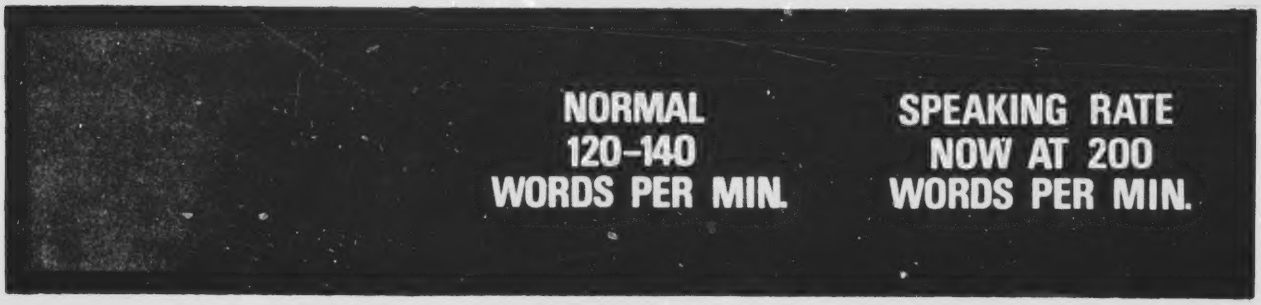


THE AUDIO PORTION OF YOUR PRESENTATION CAN BE ALTERED TO SUIT THE VIEWER.



NORMAL
120-140
WORDS PER MIN.

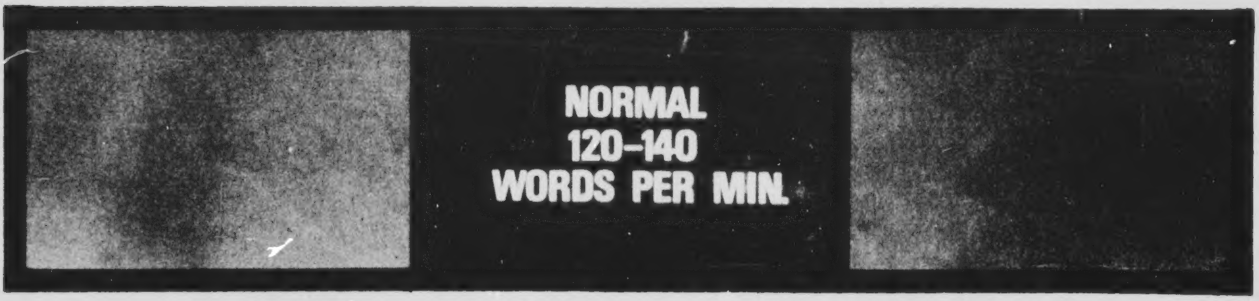
A PERSON NORMALLY SPEAKS AT AN APPROXIMATE RATE OF 120 TO 140 WORDS PER MINUTE BUT, WITH VERY LITTLE TRAINING, THE LISTENER CAN COMPREHEND INFORMATION AT RATES UP TO 300 WORDS PER MINUTE.



NORMAL
120-140
WORDS PER MIN.

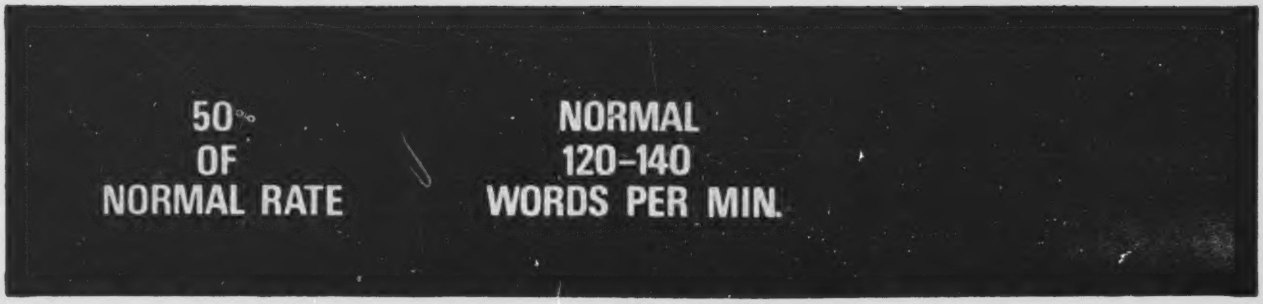
SPEAKING RATE
NOW AT 200
WORDS PER MIN.

THERE ARE ELECTRONIC SPEECH COMPRESSORS AVAILABLE TODAY THAT WILL SPEED UP THE RECORDED NARRATION WITH VERY LITTLE DISTORTION. RESEARCH HAS PROVEN THAT PEOPLE CAN COMPREHEND INFORMATION AT A "FASTER THAN NORMAL" RATE, AND, RETENTION IS USUALLY BETTER BECAUSE THE LISTENER MUST PAY ATTENTION.



NORMAL
120-140
WORDS PER MIN.

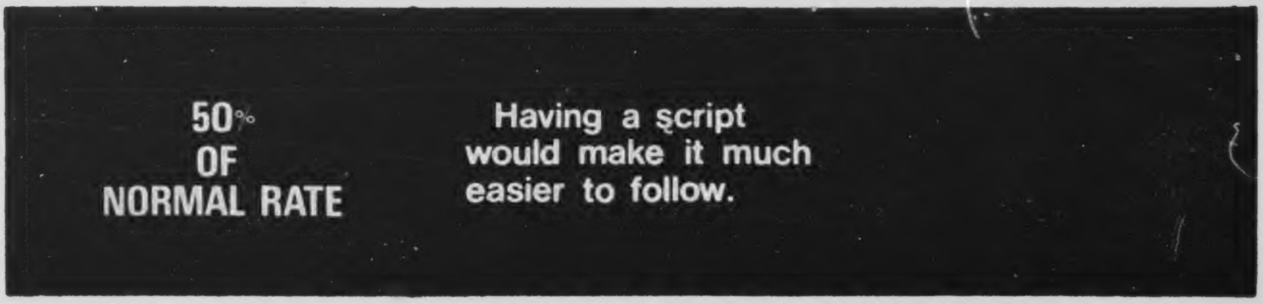
WHEN WE RETURN TO THE NORMAL RATE ... THE SPEECH SEEMS TO BE ALMOST TEDIOUS ... IF WE WERE TO TAKE A "LISTENING COURSE" IN A NEW LANGUAGE OR WANTED TO BRUSH UP ON OUR HIGH SCHOOL TRAINING IN ANOTHER LANGUAGE, EVEN THE NORMAL RATE OF SPEAKING WOULD SEEM TO BE TOO FAST.



50%
OF
NORMAL RATE

NORMAL
120-140
WORDS PER MIN.

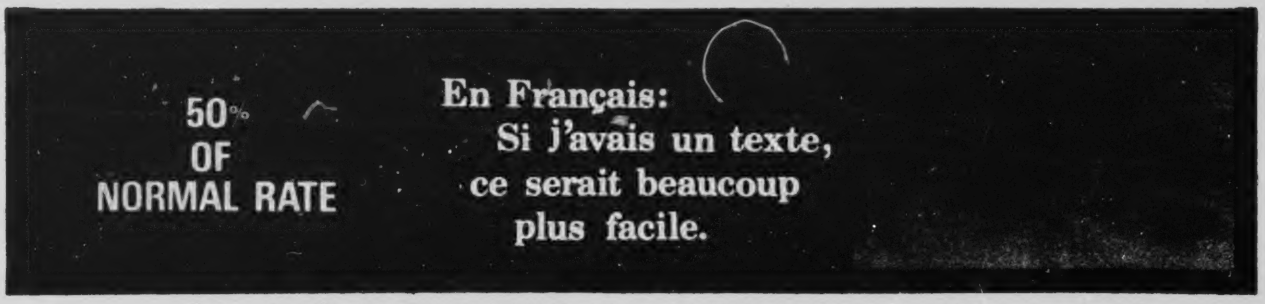
BUT IF IT WERE SLOWED DOWN TO HALF THE NORMAL RATE ... WE WOULD HAVE A BETTER CHANCE OF GRASPING IT.



50%
OF
NORMAL RATE

Having a script
would make it much
easier to follow.

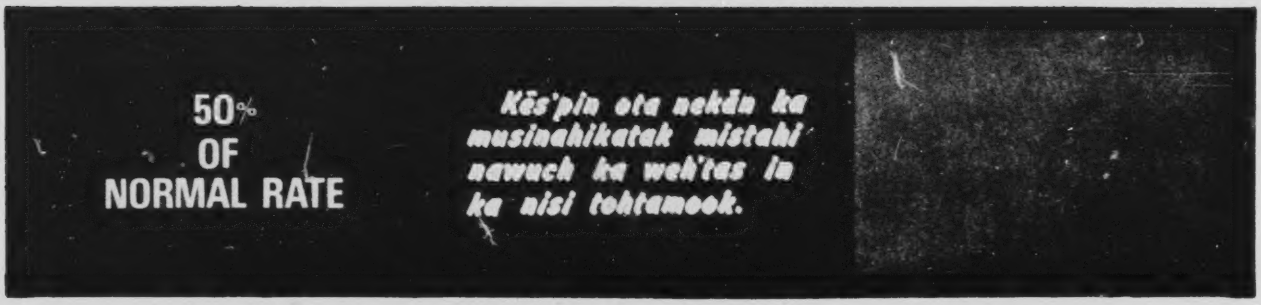
(IN ENGLISH) HAVING A SCRIPT WOULD MAKE IT MUCH EASIER TO FOLLOW.



50%
OF
NORMAL RATE

En Français:
Si j'avais un texte,
ce serait beaucoup
plus facile.

(IN FRENCH) NOW THIS LANGUAGE WOULD BE MUCH EASIER TO FOLLOW IF IT WERE ACCOMPANIED BY A SCRIPT.

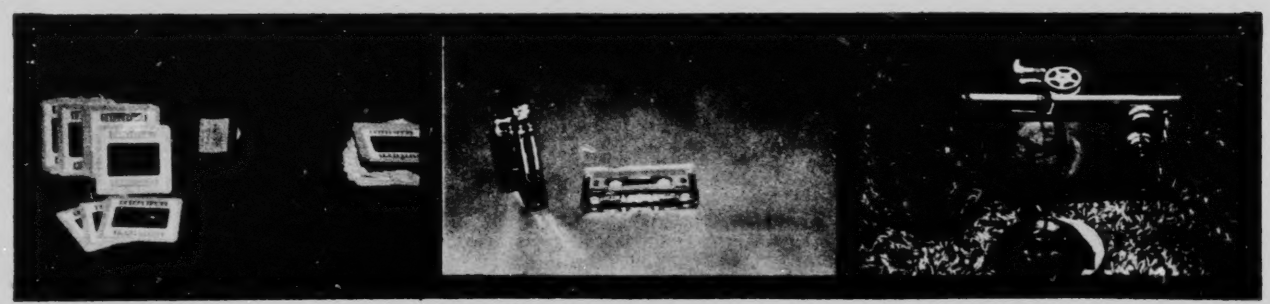


50%
OF
NORMAL RATE

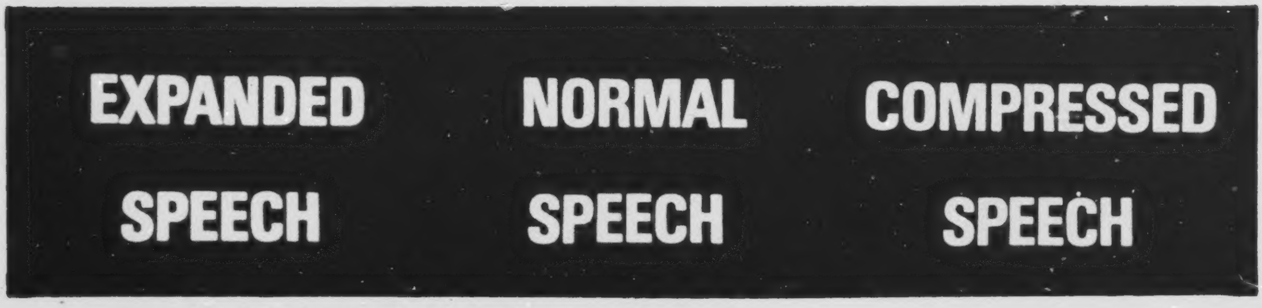
Kēs'pin ota nekān ka musinahikatak mistahi nawuch ka weh'tas in ka nisi tohtamook.

(IN CREE) NOW THIS LANGUAGE WOULD BE MUCH EASIER TO FOLLOW IF IT WERE ACCOMPANIED BY A SCRIPT.

THE PLANNING OF DETAILS FOR THE STILL PRODUCTION, OR MOTION SEQUENCES



OR, THE COMBINATION OF THESE TECHNIQUES

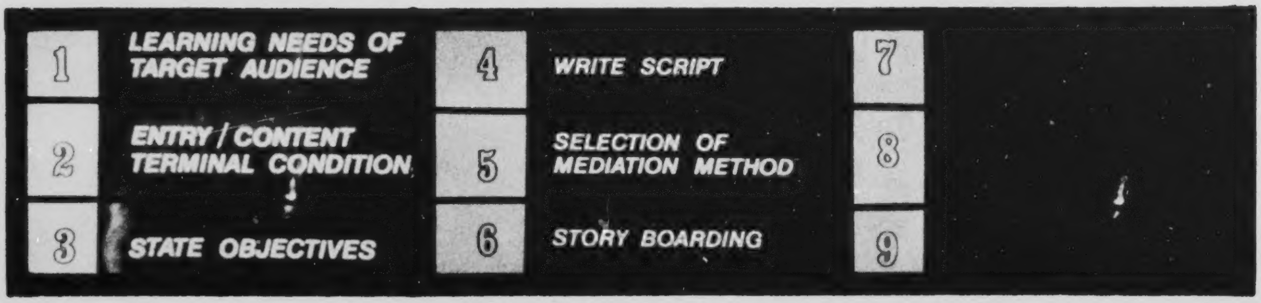


EXPANDED SPEECH

NORMAL SPEECH

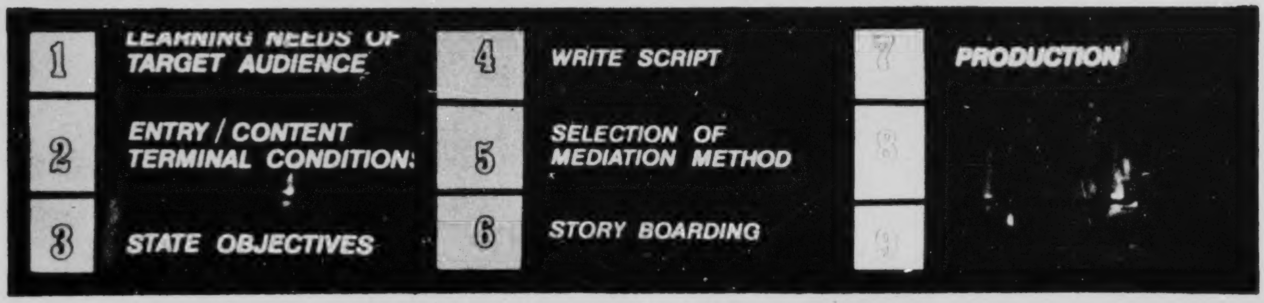
COMPRESSED SPEECH

AND THE DETAILS OF THE AUDIO SECTION



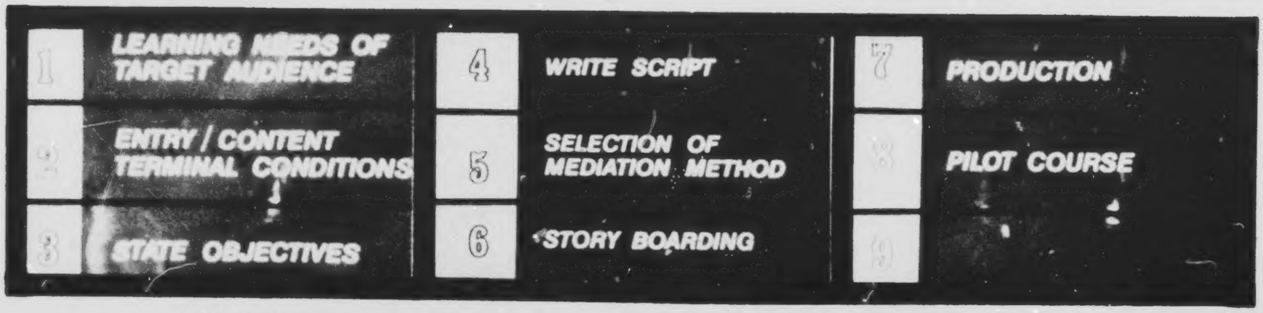
1 LEARNING NEEDS OF TARGET AUDIENCE
2 ENTRY / CONTENT TERMINAL CONDITION
3 STATE OBJECTIVES
4 WRITE SCRIPT
5 SELECTION OF MEDIATION METHOD
6 STORY BOARDING
7
8
9

MUST ALL BE DONE NOW BECAUSE THE NEXT STEP IS THE EXPENSIVE ONE.



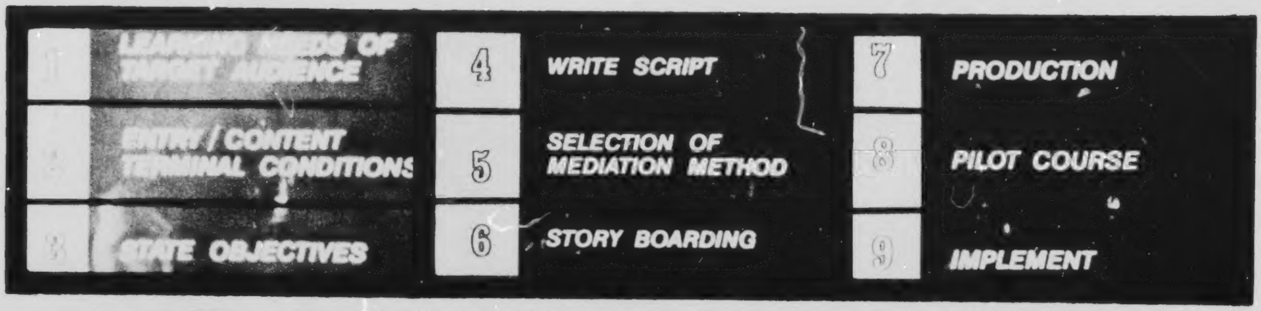
1 LEARNING NEEDS OF TARGET AUDIENCE
2 ENTRY / CONTENT TERMINAL CONDITIONS
3 STATE OBJECTIVES
4 WRITE SCRIPT
5 SELECTION OF MEDIATION METHOD
6 STORY BOARDING
7 PRODUCTION
8
9

THIS STEP INVOLVES THE PRODUCTION OF GRAPHICS, PROPS, THE PHOTOGRAPHY, RECORDING, EDITING, PRINTING AND PACKAGING OF THE PILOT PROGRAM



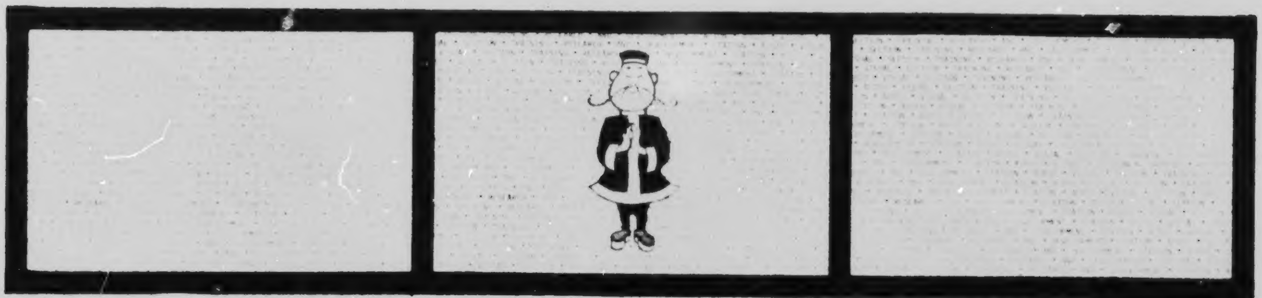
1 LEARNING NEEDS OF TARGET AUDIENCE
2 ENTRY / CONTENT TERMINAL CONDITIONS
3 STATE OBJECTIVES
4 WRITE SCRIPT
5 SELECTION OF MEDIATION METHOD
6 STORY BOARDING
7 PRODUCTION
8 PILOT COURSE
9

WHICH WILL BE USED TO TEST AND EVALUATE THE PRODUCTION.

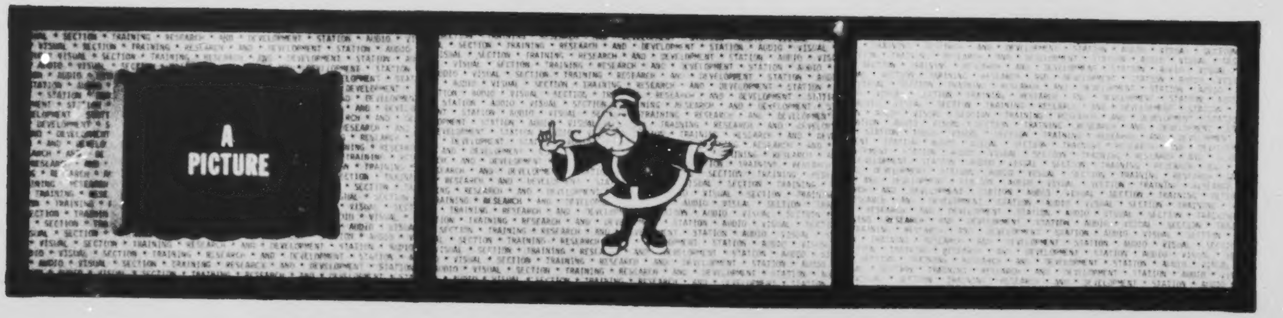


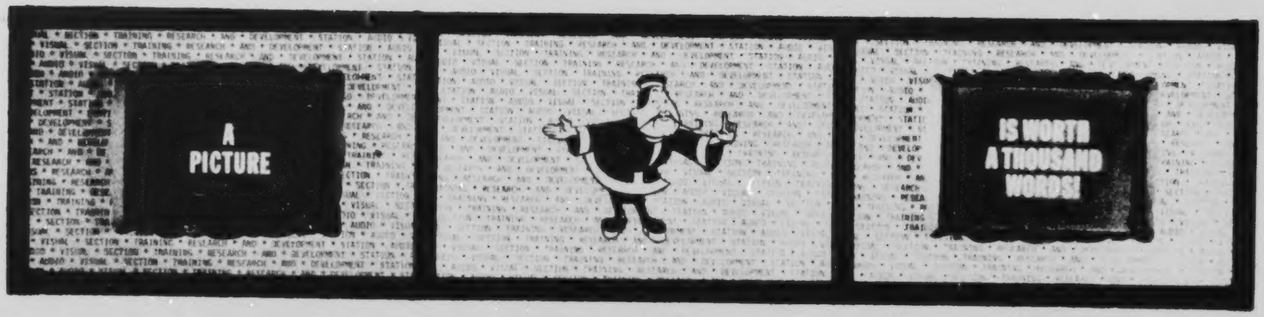
1 LEARNING NEEDS OF TARGET AUDIENCE
2 ENTRY / CONTENT TERMINAL CONDITIONS
3 STATE OBJECTIVES
4 WRITE SCRIPT
5 SELECTION OF MEDIATION METHOD
6 STORY BOARDING
7 PRODUCTION
8 PILOT COURSE
9 IMPLEMENT

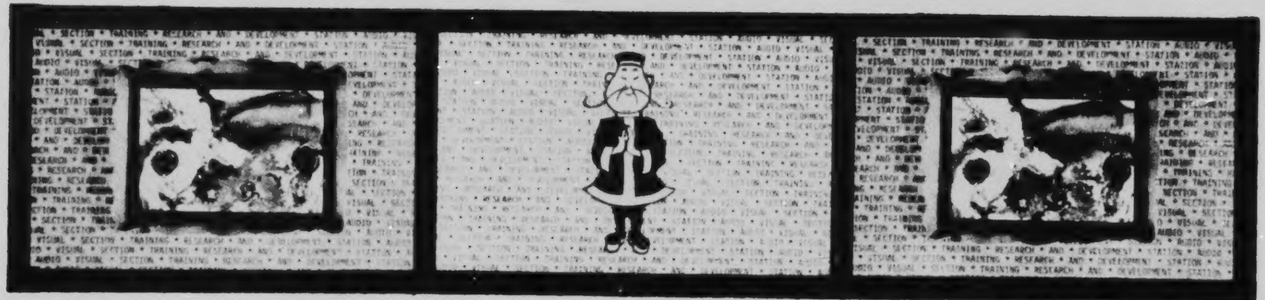
THEN, BASED ON THIS EVALUATION, THE CORRECTIONS ARE MADE AND THE FINAL PACKAGE IS ASSEMBLED AND DELIVERED.



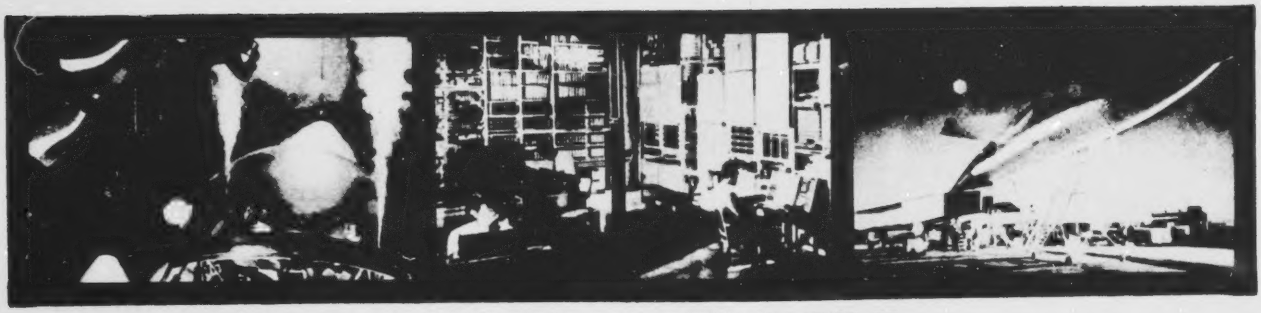
OUR SAGE OLD FRIEND OF MANY YEARS AGO WAS RIGHT .....


A PICTURE
SECTION * TRAINING * RESEARCH * AND * DEVELOPMENT * STATION * AUDIO * VISUAL


A PICTURE
IS WORTH A THOUSAND WORDS!
SECTION * TRAINING * RESEARCH * AND * DEVELOPMENT * STATION * AUDIO * VISUAL


SECTION * TRAINING * RESEARCH * AND * DEVELOPMENT * STATION * AUDIO * VISUAL

BUT TODAY THIS PICTURE MUST BE PRESENTED IN A NEW WAY.



IF YOU ARE GOING TO KEEP AHEAD OF THE KNOWLEDGE THAT IS AVAILABLE TO US TODAY, NEW DEMANDS WILL BE PLACED ON YOUR COMMUNICATION SKILLS. THESE DEMANDS MUST BE MET.

YOUR IDEAS

YOUR IDEAS ...

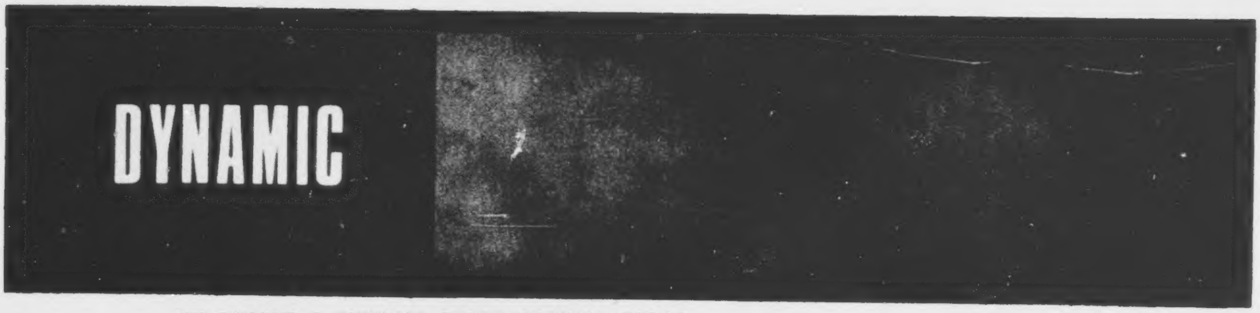
YOUR IDEAS

YOUR CREATIVE DIALOGUE

TODAY'S AUDIO VISUAL TECHNOLOGY

YOUR CREATIVE DIALOGUE ... TODAY'S AV TECHNOLOGY ...

MUST MERGE ...



TO BECOME A DYNAMIC INSTRUCTIONAL FORCE.

INSTRUCTIONAL

FORCE

DYNAMIC INSTRUCTIONAL FORCE

CHAPTER IX

THE ROLE OF EVALUATION IN THE DEVELOPMENT OF TRAINING PROGRAMS

Philip W. Warren*

---

* Psychology Department, Douglas College, New Westminster, British Columbia

Mr. Warren acknowledges the assistance of the following individuals in the production of this chapter:

D. Stuart Conger - Director, Training Research and Development Station, Prince Albert, Saskatchewan

Ralph Himsl - Superintendent of Separate Schools, Lethbridge, Alberta

Arthur Lamrock - Co-ordinator of Testing and Research, Greater Victoria School District, Victoria, British Columbia

Arthur D. Smith - Manager, Skill Development Studies, Training Research and Development Station, Prince Albert, Saskatchewan

TABLE OF CONTENTS

Page

I. GENERAL ORIENTATION TO EVALUATION IN PROGRAM DEVELOPMENT

A. Introduction 204
B. Program Evaluation as Related to Research 205
C. The Scope and Definition of Evaluation 208
  1. A Classification of Evaluation Approaches 208
  2. A Survey of the Various Problems and Evaluation Needs in Program Development 210
  3. Differences in Viewpoints and Needs Regarding "Evaluative Information" 215
  4. Scope of Evaluation 218
  5. An "Evaluation Space" 221

II. THE EVALUATION SYSTEM OF THE LIFE SKILLS COURSE: AN ILLUSTRATIVE CASE STUDY

A. Introduction 224
B. Brief Description of the Life Skills Course 224
  1. The Need for Life Skills Training 224
  2. The Life Skills Lesson 226
  3. Lesson Implementation 227
  4. Videotape Recording and Playback 227
  5. The Conceptual Basis for Life Skills 227
C. The Context of Evaluation in the Life Skills Course 228
  1. The Formative/Summative Evaluation Distinction 228
  2. An Evaluation Typology 229
  3. Areas of Possible Evaluative Study in the Life Skills Course 232
  4. "Zones" of Evaluation of Program Results 236
D. Program Development Questions 238
E. Life Skills Evaluation Methods 239
F. Conclusion 255

III. SYSTEMS FOR THE DEVELOPMENT OF PROGRAMS

A. Stages of Program Development 256
B. Relations Between Developmental Stages and the Systems of Development 256

IV. PROCEDURES FOR DEVELOPING EVALUATION SYSTEMS

A. Evaluation Model 258

Page

B. Evaluation Requirements 259
  1. Overview of the Total Requirements 259
  2. Information Requirements Related to Developmental Stages 261
C. Development Procedures 261
  1. Outline Design Specification for Evaluation Development 261
  2. Design Specification Study and Conference 263
  3. Input from Course Development 263
  4. Input from Instruction 264
  5. Input from Administrative and Support Systems 264
D. Evaluation Component Development 264
  1. Overview 264
  2. Determine Decision Areas 264
  3. Determine Information Requirements 265
  4. Determine Methodology 265
  5. Prepare Detailed Procedures 265
  6. Obtain Approval of Component Development 265
E. System Development 265
F. Conclusion 267

V. SPECIAL EVALUATION CONSIDERATIONS IN THE DEVELOPMENT AND CONTINUED OPERATION OF OPEN, BROADCAST, MULTI-MEDIATED, INDIVIDUALIZED, CONTINUOUS PROGRESS, RESPONSIVE INSTRUCTIONAL SYSTEMS FOR EDUCATING DISADVANTAGED AND/OR ISOLATED ADULTS IN BASIC EDUCATION AND LIFE SKILLS

A. Introduction 268
B. Development 269
C. Continued Operation 270
D. Open 271
E. Broadcast 272
F. Multi-Mediated 273
G. Individualized and Continuous Progress 274
H. Responsive 275
I. Instructional System 275
J. Education in Basic Education and Life Skills 276
K. Disadvantaged and/or Isolated Adults 276
L. Contextual Evaluation 277
M. Conclusion 277

LIST OF TABLES AND FIGURES

Page

Figure 1: An "Evaluation Space" 222
Figure 2: An Evaluation Typology 231
Figure 3: Areas of Possible Evaluation Study in the Life Skills Course 234
Figure 4: Points of Evaluating Skill Transfer Across Situations and Time 237
Figure 5: Flow Chart for Observation 244
Figure 6: Flow Chart for Coach's Diagnosis/Prescription for Behaviour Change 244
Figure 7: Flow Chart for Evaluation of Group Development in Interpersonal Relations Skills 246
Figure 8: Flow Chart for Observation by Lesson Developers 246
Figure 9: Flow Chart for Training Supervisor's Summary of Coach's Daily Evaluation 248
Figure 10: Flow Chart to Coach's Rating of Students 248
Figure 11: Flow Chart for Recording Informal Remarks 250
Figure 12: Flow Chart for Rating of Interview of Group 254
Figure 13: Flow Chart for Simulated Group Problem Solving Test . . . 254
Figure 14: Flow Chart for Pencil and Paper Tests 254

Table 1: Results of Observer's Categorization of Behaviours According to the Life Skills Process/Content Model . . . 240
Table 2: Relationship Between the Development Question and Evaluation Procedures 242
Table 3: Relationship Between Evaluation Information Requirement and Development Stages 262

LIST OF ANNEXES

Annex A: Stages of Development of New Training Methods 279
Annex B: Relation Between Stages of Development and Development of Components of a Course 280
Annex C: Concept Study 282
Annex D: Course and Evaluation System Development 283
Annex E: Evaluation Component Development 284

Page

Annex F: Course/Program Trial 285
Annex G: Evaluation Development Objective 286
Annex H: Procedures for Instructional Design (State University of Nebraska) 288
Annex I: SUN Course Development Procedures 291
Annex J: Process Chart for Audiovisual Programing 294
Annex K: Open University Course Development System 296

I. GENERAL ORIENTATION TO EVALUATION IN PROGRAM DEVELOPMENT

A. Introduction

The concept of evaluation introduced in this paper is very general involving, as it does, the recognition that whenever a decision or choice has been made, there also resides an evaluation. How adequate the data used for the decision might be questioned; nonetheless, there has been a decision. To make the decisions more reliable and valid, the process of evaluation should be made as explicit as possible. Evaluators cannot state that they will have nothing to do with any decision based on information because they do not approve of using "inadequate data". Hopefully, one effect of this paper will be to provide insight into the complexity of evaluation and the magnitude of the task. It should not be looked on as an afterthought to course/program development.

Evaluation is not a negative process although to many people it is synonomous with criticism. It is not contradictory to other knowledge and data gathering methods. Both practical or applied knowledge and evaluation based knowledge are the result of a cumulation of selectively retained ideas and approaches which remain after others have been weeded out by experience. Evaluation is not in conflict with intuition, practical experience, genius, or tradition. Instead, it is supplemental to these processes, attempting to make the selective process of this evolution of procedures and ideas more precise and rapid. Basically, it is a way of increasing the exactness of the testing, probing, and selecting process; a refining process super-imposed upon the many valuable cumulations of wise practice. (Campbell, 1959) Evaluation's major virtue (if properly done) involves providing a relatively systematic method of checking and correcting preconceptions and prejudices; in general, keeping all involved more honest and less subject to self-deception (the reality testing function).

Steele, in her survey of 50 different approaches to program evaluation says: "Ideas about evaluation are changing. Beliefs about program evaluation plateaued for a few years during the 1950's and 1960's when evaluation was equated with research methodology to such an extent that sometimes the terms measurement and evaluation were treated interchangeably. During that period, too, evaluation was often limited to determining whether content-specific objectives had been achieved.

"Then the late 1960's brought an influx of new programs and new demands for evaluation. Established concepts didn't deliver. As a result, new ideas about evaluation emerged and new frameworks appeared. There's considerable divergence in those ideas. Most of them are still in the trial-and-testing stage. Many paths are being taken off the plateau of the earlier period, but few of those paths are widely accepted.

None can be considered the main route. Some explore evaluation from the standpoint of its purpose, some from the standpoint of need, some from the view of organization and system, and some from the interactive elements involved. New definitions of evaluation are evolving ... development of theory and practice is not yet sufficient to completely deal with current needs. However, the key ideas that are emerging can help you develop strategies that will work in your situation." (Steele, 1973, pp. 20-21)

B. Program Evaluation as Related to Research

Steele differentiates Program Evaluation (the focus of her monograph) from Program Research and Evaluative Research. The distinctions are not clear cut, since each may have an input into program development and each may use similar methods and terminology. However, understanding the differences between program evaluation and research will provide researchers with a clearer concept of the task before them when confronted with problems of program evaluation. Grasping this distinction may ward off conflicts among the members of project staff (e.g., program managers, developers and evaluators) which have been characteristic of organizations seeking to develop complex programs to solve social problems. Researchers/evaluators in these settings frequently have taken a negative (critical) stance towards development similar to outsiders who inform the program developers if and when they have come up with anything worth developing. This stance produces considerable feelings of threat and accompaning hostility. One reason for the many evaluation frameworks being developed was the feeling that this was not a feasible method of operating.

In general, research implies science and in the search for new knowledge, program development, and improvement are secondary. The audience of the research output is considerably removed from developers and managers, usually being aimed at the larger professional community of science and research. The interests, methods of operating, and communication modes of these people are quite different from those of program managers and developers who are trying to cope with very practical and immediate problems of improving programs. Program evaluation is not trying to obtain generalizable information or approaches although this may be a side product. The focus is to obtain sound and reliable information to use within the context of a specific program. While it resembles research orientations to programs and is not necessarily in conflict, program evaluation is a field in its own. Processes and procedures must be developed within its own context rather than be borrowed directly from the research aspects.

"The confusion of evaluation and research has led to underdevelopment of evaluation procedures in at least five main areas: suiting data techniques to evaluative needs, understanding criteria, distinguishing between description and judgement, providing useable information, and communicating evaluative findings.

"First, although evaluation may borrow data treatment methods like precise instrumentation and statistical processes from research, they must be tested for validity and reliability as tools in evaluation rather than automatically transferred and applied as they'd be in research situations. Considerable adaptation may be needed. For example, when is it best to examine average gain for a whole group and when is it better to examine the number of students making specific amounts of gain? Is it necessary to rule out chance occurrence at the .05 level, or would a .40 or .25 level be adequate in evaluation?... The type of data recorded on student-teacher interactions might take a different nature when a program is being evaluated than it does when it will be used to test a particular research hypothesis. A good many other examples could be given.

"Although we're becoming aware that new procedures are needed and standard research techniques may need to be amended and adapted, this is a relatively new field. Some evaluators and researchers, for example, have been suiting the statistical significance level--the level at which chance occurrence is ruled out--to the context of the problem for some years now. But little has been done to identify the conditions under which a .25 or a .10 level may be appropriate in program evaluation. In many instances, evaluation may not require the same degree of stringency in data dealing as does research. This may be particularly true when the consequences of inaccuracy are relatively small.

"Second, criteria must receive much more attention in evaluation than in research. In research, hypotheses serve as the basis for deciding what information to gather and how it's to be organized to be interpreted. In evaluation, criteria--decisions about what the program will be judged on--play the same role. Evaluative criteria aren't always the same ones that apply in research, although there's a similarity in the role of criteria without dealing with them as important phenomena. The fledging researcher has often been so enthralled with the data-handling procedures that he hasn't mastered the concept of criteria as it applies in research. So, he's unable to carry even the basic concept into evaluation.

"Although some program criteria presently exist either in a formal or subconscious state, they must be probed for clarity, reality, and the extent to which they portray the most valuable things in programs and programming. Programs can appropriately be judged on a wide range of criteria, some of which are in conflict with others. Criteria need to be ordered in terms of their importance. For example, which program is more successful--the one that reaches a large number of people with a moderate amount of help to them, or the one that gives great help to a very small number? Which program is more successful--the one producing efficient results for a short period of time, or the one with only moderate results with a longer retention time?

"Criteria describe what's of value or good. They're debatable. Although programmers sometimes wish to avoid the trauma of debate, a confrontation on criteria can clear up some of the ambiguities and frustrations that plague evaluation.

"Program personnel and their professional groups are responsible for developing, screening, and debating criteria. In doing so, considerable attention should be given to the views of clientele. Although experts knowledgeable in a given field can make recommendations and researchers can help clarify issues and determine the degree to which certain criteria are commonly held, it's not the outsider's prerogative to establish the criteria for the evaluation.

"A third major area for development is the greater understanding of the difference between description and evaluation. A presentation of research type findings about a program usually constitutes a description of the program or of its results. Evaluation doesn't really occur unless judgements are made about such things as whether the processes used were suitable and of high quality or whether the results produced were enough for the resources expended, or how effective the processes were in producing the results. Research tries hard not to be judgemental. Evaluation, on the other hand, doesn't fulfill its role unless it takes responsibility for delivering conclusions that do judge, identify the adequacy of what's being described, or show relative advantages or disadvantages of two or more alternatives.

"It's probable that in some situations, particularly when reporting to outsiders, the programmer may only want to describe what happened in the program and/or its results. However, in decision making, descriptions are useless unless judgements are made and values assigned...

"A fourth major area for development deals with the importance of being able to use data. It's not enough to just collect accurate data. Those data must be accurately and immediately interpreted within a specific context. Interpretation rests with man. Wisdom and experience in forming and using criteria, in assessing the limitations of data and the potential consequence those limitations pose, and finally in making, communicating, and defending judgements are more important skills in evaluation than are the skills of data gathering and statistical analysis. Scientifically produced data are a valuable input in evaluation, but seldom should stand alone as the output from it.

"From one perspective, data-gathering activities are a separate function from evaluation. They're essential to it, but can be considered as prior and prerequisite to the actual act of evaluation. Unfortunately, as we've borrowed from research, we've been more apt to focus on the data-gathering techniques than we have on the part of research dealing with using data. We've hoped that having high quality data would solve our problems. We're finding that data in and of themselves give few answers. The next step in understanding evaluation and its procedural development must deal with processes...that are essential in using information in evaluating programs.

"Fifth, our associating evaluation with research sometimes leads to unproductive ways of communicating results. We may be too prone to prepare reports in traditional research ways that relegate conclusions and implications to the end of the report. The people who should use evaluation seldom get to the end of the reports. If they do, they are often so confused by academic hedging and research jargon that they can't decipher what the evaluation really means in terms of their own needs and situation. Currently a variety of ways of inserting evaluation findings and conclusions into the bloodstream of the program and community are being emphasized.

'Meaningful evaluation has been stunted by failure to recognize that program evaluation and evaluative research, although related, aren't the same. Now that the nature of the differences are clearer, progress should be made in developing specific procedures that work well in evaluation." (Steele, 1973, pp. 30-35)

C. The Scope and Definition of Evaluation

1. A Classification of Evaluation Approaches

Using Steele's (1973) analysis, but adding the first category, the following classification scheme is provided as a framework:

I. Evaluation of the Super-ordinate (Contextual) Systems of a program (the influence of the program on the larger network of inter-related social systems).

II. Evaluation of participants (grading, certification, etc.).

III. Evaluation of personnel (performance review, skills surveys, job satisfaction, etc.).

IV. Evaluation of program.

A. Evaluation of process (group interaction, effectiveness of instructional approach, etc.).

B. Evaluation of results.

*1. Results--Attainment of Objectives.
*2. Results--Evaluation of Outcomes and Effects.

C. Evaluation of programs as functioning, producing systems.

1. Patterns of program systems.

*a. Evaluation as Input Into Decision Making.

        i. Major or general decisions.

        ii. Specific decision situations (selection of materials, setting priorities, etc.).

    *b. Evaluation of Program Parts.

2. Patterns of program systems as mirrored in evaluation.

    *a. Evaluation--Kinds of Data; Types of Activities.

    *b. Evaluation Processes.

        i. General processes.

        ii. Specifically applied processes.

---

* Indicates the six categories Steele used as major groupings for the organization of her monograph (from Steele, 1973, Table C-1, p. 238).

As mentioned, Steele surveyed 50 strategies of evaluation and classified them into the six categories indicated by * above.

This provides one way of categorizing current approaches to evaluation. Although several of the approaches could have been placed in more than one category, she grouped them according to their primary focus.

The various approaches are not substitutes for each other. Few, if any, are in conflict since many can be used in combinations of two or more. Even the approaches within a category are not different ways of doing the same thing and can be used in various combinations, at various times, for various purposes.

The model, "Evaluation of Program Parts", (Category 'C.1.b.' above) can be used in conjunction with "Evaluation as input into decision-making" (Category 'C.1.a.') with no difficulty, since the latter deals with qualities or stages of programming where as the former deals with actual parts of that program. An approach selected from Category 'C.1.a.' would establish the program sequence of evaluate, develop, re-evaluate, etc. An approach selected from C.1.b. would indicate what element would be evaluated.

The approaches in "Evaluation - kinds of data" (Category 'C.2.a') emphasize parts much as those in 'C.1.b.' but refer to kinds of data used rather than program parts directly. Some of the approaches in the "Evaluation processes" (Category 'C.2.b.') deal with basic processes used regardless of the aspect and the program being evaluated. Appraisal processes, which emphasize human judgement, and approaches that emphasize use of systematically collected data are not alternatives to each other and should be used together. Other approaches in this category deal with specific applications of process; stressing continuous evaluation and using either appraisal or systematic data processing or both to assist program development.

The most highly developed approaches are in category 'B.1.', "Results - Attainment of Objectives". Much more attention has been given to the details related to evaluating results using attainment of objectives as the basic criteria of success than to any of the other forms of evaluation. Most of the approaches in category 'B.2.' try to define and describe the types of outcomes and effects that make up program results, not restricting their focus to attainment of objectives. Methods in categories 'B.1.' and 'B.2.' can be subsumed within the approaches in categories 'C.1.a.', 'C.1.b.', and 'C.2.a.'.

From this brief discussion of how the various categories of evaluation relate to each other, one readily gains the impression that evaluation is far from the "cook book" specification stage and is still more art than science. However, with Steele's pioneering effort, the first step has been made in a science of evaluation systems usage.

2. A Survey of the Various Problems and Evaluation Needs in Program Development

Steele provides a cross-referencing guide for people involved in developing and managing programs to assist them in using the myriad approaches to program evaluation. In any complex program, more than one evaluation framework will be needed since different approaches accomplish different things. Table 3 (Steele, 1973, p. 57) lists these general needs: (1) frameworks that help make major decisions and overall program management; (2) frameworks for examining the impact and larger results of programs; (3) frameworks that guide the organization and use of program components; (4) frameworks for viewing the program through the eyes of the participant; (5) frameworks that guide evaluative processes; (6) frameworks for examining the results of intervention (e.g., instruction); and (7) frameworks that serve specific purposes.

Table 4 (Steele, 1973, pp. 61-74) lists problems, with their relevant evaluation approaches, under three general headings: Problems in program management, Problems in program development and Problems in program evaluation.

Problems in Program Management involve such things as:

- Guiding a program that involves several staff members with roles dependent on prior work by others.
- Understanding the kind of decisions involved in programming.

- Getting the most out of limited resources.
- Deciding whether ideas for programs are good.
- Supervising activities of several para-professionals.
- Securing additional funding.
- Developing long-range goals and mission.
- Reviewing long-range goals.
- Improving teamwork within your unit.
- Understanding the stages of programming.
- Understanding relationship of evaluation to decision making.
- Defining program efficiency.
- Settling disputes when two or more methods or plans are advocated for doing the same thing.
- Designing a management information system for your unit.
- Designing accountability strategies.
- Developing an organization and climate that will improve programming.
- Identifying and weighing groups and other pressures that must be considered in programming.
- Getting new ideas adopted by the staff.
- Organizing support resources effectively.
- Increasing operation efficiency.
- Cooperating with content experts.
- Using a systems approach to organizing programming.
- Developing criteria to guide the work of your unit.
- Considering input, process, and output relationships of various parts of your program.
- Developing a multicourse curricula or a multi-activity program.

- Increasing the contributions of volunteers.
- Improving everyday operations.
- Determining whether programming activities are on target in terms of the unit's mission.
- Using information in making program decisions.
- Assigning resources to staff units.
- Managing the teaching-learning transaction.
- Developing a personnel evaluation system.
- Analyzing weaknesses and problems in the operation of the unit.
- Working with an advisory committee.
- Improving use of time and other resources.
- Developing budgets.
- Guiding and controlling the total programming process.
- Helping staff use evaluation as a management tool.

Problems in Program Development involve such things as:

- Setting priorities.
- Choosing among program possibilities.
- Determining the kind of results you are aiming for as you design the program.
- Developing objectives.
- Determining the right level of objectives.
- Selecting content and focus.
- Identifying what participants see as appropriate program activities.
- Examining factors affecting participation and learning.
- Developing a project or program plan.

- Developing a pilot project.
- Determining how you can use scarce resources most effectively in the program.
- Making sure that all of the elements of the program are appropriate.
- Understanding how various aspects of the program fit together.
- Working effectively with others in the program.
- Choosing among resources, books, audio-visual packages, etc.
- Preparing instructional plans.
- Determining whether a program is progressing toward its goals.
- Finding out why a program is not producing as much as you expect it to.
- Finding out how well your first programming efforts are achieving.
- Clarifying what kind of results to expect from a new program.
- Understanding how program components interact to produce results.
- Testing a particular instructional sequence to see what it is achieving.
- Selecting the most effective method for a particular task.
- Determining the effect of a program on a community.
- Identifying whether you are reaching the right clientele.
- Revising a pilot program and developing a guide for others to follow.
- Getting other people's ideas on how your program can be improved.
- Improving on-the-spot judgements as a program progresses.
- Examining the results of programs.

- Identifying key elements contributing to the success or failure of a program.
- Preparing a program report.
- Deciding what to emphasize in a report prepared for administrators and influentials.

Problems in Program Evaluation involve such things as:

- Improving staff attitude toward evaluation.
- Distinguishing between describing and evaluating program results.
- Determining results when objectives were poorly stated or changed during the program.
- Developing criteria for judging the program.
- Dealing with several criteria at one time.
- Forming judgements about programs.
- Involving lay people in evaluation.
- Organizing a comprehensive program review, accreditation team, etc.
- Preparing for an accreditation team, monitoring team, or comprehensive review.
- Determining what parts of the program to include in your evaluation.
- Identifying appropriate data bases and sources of data.
- Selecting techniques to carry out specific evaluation tasks.
- Categorizing kinds of judgements that need to be made about a program.
- Deciding whether to consult an evaluation expert.
- Determining whether an extensive research effort is appropriate.
- Handling a good deal of unrelated data and making sense out of how it fits into patterns.
- Setting performance standards.

- Determining the kind of data needed.
- Establishing or evaluating sampling procedures.
- Establishing or evaluating measurement procedures.
- Examining assumptions related to data.
- Identifying flaws and limitations in data as a basis for assessing the probable accuracy of the data.
- Developing evaluation reports.
- Getting evaluation findings used.
- Evaluating evaluation.

For each of these problems Steele lists suggested evaluation approaches which, in her judgement, will be useful. In most cases more than one approach is listed for each problem and, of course, any given approach will be useful in several problems. However, as is emphasized throughout the monograph, there are no guarantees of solutions. Considerable ingenuity and skill will be required to solve these problems but one does not have to "reinvent the wheel" since there exists a number of possible approaches for a solution.

3. Differences in Viewpoints and Needs Regarding "Evaluative Information"

Steele points out that a major source of confusion regarding evaluation involves the variety of people who want "evaluative information". Not only do various people desire this information but the information they want is quite different since they have different interests, needs or tasks. She lists six types of people who desire different types of evaluative information: Social policy makers, Civic leaders and other influentials, Administrators of funding agencies, Local administrators, Program personnel and Clients.

Social Policy Makers (legislators who introduce and promote legislation, politicians, leaders of causes) desire conclusive data to defend or support policy and funding decisions.

Civic Leaders and Other Influentials, because of their formal or informal leadership status influence participants and supporters of a program.

Administrators of Funding Agencies tend to be "in the middle" since the organization or government branch to which they are accountable, require data to support allocations of funds.

Local Administrators of Programs need evaluative information to meet the requests of funding agencies, as a base on which to make decisions on budget and as a guide for staff when making basic program decisions. They use program evaluation as a base for providing administrative leadership.

Program Personnel (developers, implementers, etc.) need evaluative information to assist them to develop, test and redevelop their programs as well as information on the larger impact of the program.

Clients are those whom the programs are intended to benefit in some manner.

Since the amount of a program budget alloted to evaluation is usually not large, and since evaluation is a complex activity, not all of these people will receive the evaluative data they feel they deserve or require.

"One way of reducing uneasiness, if not frustration, is clearly understanding the various needs involved and the amount and kind of activity needed to satisfy them. Then, better choices can be made about how the program unit will invest its evaluative resources.

'Most models, frameworks, or approaches to evaluation have been designed for a specific type of situation. Such frameworks seldom handle the variety of other needs and evaluative responsibilities of local programming personnel. For example, a model designed to provide the social policy maker with sound generalizable data may have little value in helping the programmer guide and improve a program that is in-process, and vice versa. The kind of evaluative information provided by a particular evaluation approach needs to be examined in terms of its value compared with other evaluative information provided by other approaches.

'Not only must the six groups clarify and better communicate their needs and program administrators take a more active role in trying to establish balance among needs, but all six groups must take more responsibility for developing evaluation models." (Steele, 1973, pp. 8-9)

The types of programs considered in this paper are quite complex involving many aspects internally and many connections externally. If a local program is one of several similar efforts carried out in different parts of the country, then the evaluative needs of the "head office" may not be the same as for any given local program and may even hinder local evaluation by taking up time, manpower and other scarce resources. Thus there is need to make the evaluation policies and procedures at different levels clear and consistent. This calls for a guide to systematize evaluation systems (Steele, 1973, pp. 9-10). The dependence on funding agencies usually complicates evaluation procedures since the funding agency frequently has no clear idea of what it wants. Thus the local program becomes involved in a frustrating and wasteful process of second guessing.

These activities have little value to either the local program or to higher administration. "Devising an evaluation system that's efficient and effective for all concerned in a multi-location, multi-level administrative network has different dimensions than a system developed to work effectively for the local program." (Steele, 1973, p. 11)

Programs which address themselves to social problems, reform and seek to produce social inventions (Conger, 1973) are frequently involved in conflictual situations posing additional need for evaluative data and making the evaluation process more emotionally laden than it is ordinarily. Conflicts involve reconciling or at least coping with opposing value orientations. "Evaluation can be an important tool in conflict situations. However, it must be a kind of evaluation that can deal with value questions. As of yet this is a relatively undeveloped area in evaluation theory and in the systematic practice of evaluation. The scientist is trained to avoid valuing. Thus, his evaluation models may fail to adequately consider the process of dealing with values in evaluation." (Steele, 1973, p. 13)

Such programs will usually have somewhat strained relations with more established programs and agencies. The clientele of the new program frequently are drop outs or rejects from the established agencies and institutions and thus the new program needs, more than ever, solid evaluative data. However, this loads the program evaluation process with considerable "emotional charge".

Since the approach to evaluation described in this paper is relatively recent there has not been sufficient time to work through many of the problems of program evaluation. In this way, the program and the program evaluation system have to be developed in a "boot strap" style of operation. "When a program lacks past operating experience, it has a particular need for evaluation. For example, evaluation can help programmers build an understanding of their efforts that might otherwise take years to identify through ordinary activities. Evaluation can rapidly increase the information available on programming and reduce the need for trial-and-error activity. It can be used to build an image that ordinarily comes slowly through increased contact with the program by and through the participating clientele. When program personnel are alert and strong enough to prevent being shackled with old approaches to evaluation, lack of past history provides an opportunity to build evaluation strategies that meet their unique situation. However, making use of this freedom requires strength, perseverence, and the ability to develop logical rationale for the evaluative activities used." (Steele, 1973, p. 14)

Systems analysis has made a major input into the evaluation of programs mainly because these programs are complex systems (Romiszowski, 1973; Stowe, 1973). The "Open University" of England has made extensive use of systems analysis in their development and evaluation activities. However, Lewis (1971c) has pointed out that very high powered network planning methods (e.g., PERT - Program Evaluation and Review Technique - and Critical Path Analysis) are not transferable entirely from engineering because too many variables can not be assessed precisely enough to allow accurate time estimates, etc. However, for providing the "Big Picture" (activity structure, see Annex I) they are very useful approaches. It can not be assumed "...that the programmer should always be able to identify in advance what results his program will produce and, like the factory assembly line, produce those results come what may...[Nor can it be] assumed that the programmer should by one means or another, be able to control the participants and other human environmental factors in the same way that man can control machines. Many programs...are producing greater and often more important side effects than the specific objectives of the program. One way of looking at the finding of important side effects is that the wrong objectives were set--the programmer couldn't diagnose what the real needs were. However, another view is that the exact effects of a given program input aren't readily predictable. It may have influence (helpful or harmful) far beyond its designed intent. Evaluation should consider those results as well as how the program accomplished what it said it was going to do." (Steele, 1973, p. 16)

4. Scope of Evaluation

The general scope of evaluation can be indicated by enumerating four facets of evaluation processes: the topic areas where decisions are made; the type of data base used in the decision; the source of the data for the decision, and the time of the decision.

Decisions are made regarding policy, level of intervention, type of intervention, areas and agencies of intervention, dissemination practices, organizational structure, methods and systems of evaluation and measurement, theory and models, training methods, student progress, instructor characteristics (ability, training, personality, style), course/curriculum content and so on.

The type of data base on which these decisions are based can be divided into:

- data from the implementers of interventions including such things as objectives of agencies, social pressures, personal values and prejudices of policy makers, professional judgements and opinions, priorities and standards, etc., and

- data from the people receiving the intervention which include such things as attitude and personality measurement, statistical results (descriptive statistics, difference tests, measures of association, etc.), standardized tests, skill levels of students, student employment rates and incomes, demographic statistics on students and potential students and so on.

The source of the data is similar to the data base but involves more detail as to the people on which the data is gathered, e.g., politicians, funders, superordinate support organizations, communities, user agencies, present and potential students or clients, outside professionals and consultants, outside evaluators, project personnel (management, development, training, evaluation, and support staff) and sometimes even logical and rational considerations are used as sources of data for decisions.

Finally the time of the decision can range from very early policy decisions through the various stages of development of a program to decisions regarding where to implement programs. All of these aspects of the decision/evaluation process need to be considered in formulating a complete evaluation system.

Given this broad scope it is apparent that the term "evaluation" no longer refers to a well defined and explicit activity. Rather, it is a generalized process. According to Steele, "The two most prevalent ways of looking at evaluation as a generalizable process are:

1. As a process of forming judgements about programs using criteria or standards of comparisons and descriptions of what occurred and resulted in the program.
2. As a process of using information in comparing alternatives in reaching program decisions.

The first concept places the emphasis on judging and forming conclusions about program activities and program results. These conclusions are then fed into decisions about further and future activity. The second concept emphasizes identifying alternatives and then using evaluation to help choose among those alternatives... There's a good deal of similarity between the two concepts of evaluation... Both are so new that little attention has yet been given to how they relate to each other--how judgement and decision making function in relation to each other. Much more exploration of the linkages between the two is needed." (Steele, 1974, pp. 22-23)

Program evaluation is broader than evaluating particular instruction or training effects on an individual. Part of program evaluation involves instructional evaluation, to be sure, but it deals with additional aspects of the program such as the effects of different combinations or sequences of training, or the total impact of participating in a program on an individual and his social environment. It also is concerned with such things as the relation between instructional or program units and agency goals, etc. "Even though good instructional evaluation provides essential information for evaluating a program, it does not provide all of the information that is necessary even in programs where instruction makes up the total of the program. It is possible to do a good job of instructional evaluation without ever really doing program evaluation." (Steele, 1973, pp. 29-30)

Program evaluation is also more than examining the attainment of objectives although, again, it includes this as one aspect. Indeed, restricting the evaluation of a program to objectives may ignore more important results and outcomes. To focus on the results of the program means that you look at attainment of objectives, to be sure, but recognize that most programming situations produce unanticipated results and sometimes the values or harms of these are more important than the objectives per se. If the objectives stated for a program are not germane or are too narrow then important outcomes will be overlooked if the focus is too narrowly on attainment of objectives. "Evaluation which is concerned with the overall effectiveness of a program is concerned not only with results in terms of behavioral changes in people, but also with the proportion of the potential clientele that is reached, the balance in types of people reached, the extent to which the results deal with urgent and continual need, and the care with which participant, agency, and societal resources are used. Program evaluation is as concerned about the value and suitability of the program as it is with whether its purpose is accomplished." (Steele, 1973, p. 25)

Program evaluation is not just descriptive since it gives both evidence of results, whether intended or not, and evaluates the results.

"Past approaches to result evaluation limited themselves primarily to identifying if results did occur and testing whether they probably came about as a result of the program. Seldom did they try to identify the sufficiency of those results... Evaluating results gets into questions requiring more information than just whether the program produced results. It involves such sticky questions as: ...Are the results important? Do they contribute more to the participants and society than if the time and other resources had been invested in other things? Were they produced at a reasonable cost? Are the results sufficient in terms of the overall need? Are they sufficient in the expectations of the participants and the amount of time and energy they invested? Is there any evidence that it's realistic to expect a program to produce more results than this one has, given the same budget, personnel, and working conditions?... Most of these questions can't be answered by traditional evaluation approaches. Ways of dealing with these types of questions still must be developed." (Steele, 1973, pp. 25-26)

Finally, program evaluation involves more than evaluating the results of a program. Until recently, evaluation was viewed as primarily a summative activity in which program results were studied. This involves using standard experimental design applied, inappropriately, to complex and dynamic intervention systems in the process of development. Formative evaluation, which influences the program while it is developing, is now seen as equally important. Evaluation of the processes of program development and implementation (planning, management, coordination of resources, immediate feedback of aspects of program intervention results to developers, etc.) is seen as essential to the overall impact of the program.

> "...the emerging emphasis is on frameworks that consider both process and product and, more importantly, the interrelatedness of the two. Program evaluation deals with the program as a functioning, producing system. It includes results as one key component, but also examines other aspects of the program. Processes and structural components such as teacher's performance, materials, and facilities are examined in relation to how they can be more effective in generating a viable, valuable program. The emerging models differ in how they define the parts of the functioning system... Program evaluation serves both during the actual program operation and in retrospectively analyzing how the particular level of results was produced. At a broader level, it expands our knowledge of what makes up successful programs under specific environmental conditions (backgrounds of students, extent of budgetary support, social pressures). Such models are particularly important to new and/or controversial programs." (Steele, 1973, pp. 27-28)

The broadened scope of evaluation and its essential function in management and decision making has meant an increased emphasis on the relationship of evaluation to people. "Evaluation as input into decision making emphasizes the need of interface and interaction. Evaluation for program improvement recognizes that those who must make the improvements must be actively involved in the evaluation. Recognition of close relationships between evaluation and politics and policy emphasizes the human element. The growing awareness of criteria and judgement's central place in evaluation emphasizes that those criteria come from people and that judgement is made by people. Even in terms of data, the need for involving a variety of people in interpreting data so that a more complete picture can be secured is becoming more apparent. For a few years we tried to take evaluation out of the people realm, hoping to increase its objectivity. Lately, however, there's a growing return to active involvement of many minds as conclusions are formulated and decisions made. We need ways of increasing objectivity while relating closely to the people involved during the evaluation process." (Steele, 1973, p. 37)

5. An "Evaluation Space"

Figure 1 consitutes an attempt to picture the complexity of evaluation. This diagram seeks to indicate much of the possible interactions between people in various positions and situations with respect to the developer/evaluator of a given program in the process of development. There are 300 possible cubes to examine in relation to evaluative concerns and, of course, each cube represents a variety of sub-interrelations. We begin at the most macro level.

a. Social Context: This involves the total social/cultural/economic/political context of a program and includes Government institutions (national, regional, provincial, local), Educational organizations and institutions (at all levels from pre-school to graduate school, technical education, public and private), Information institutions and agencies

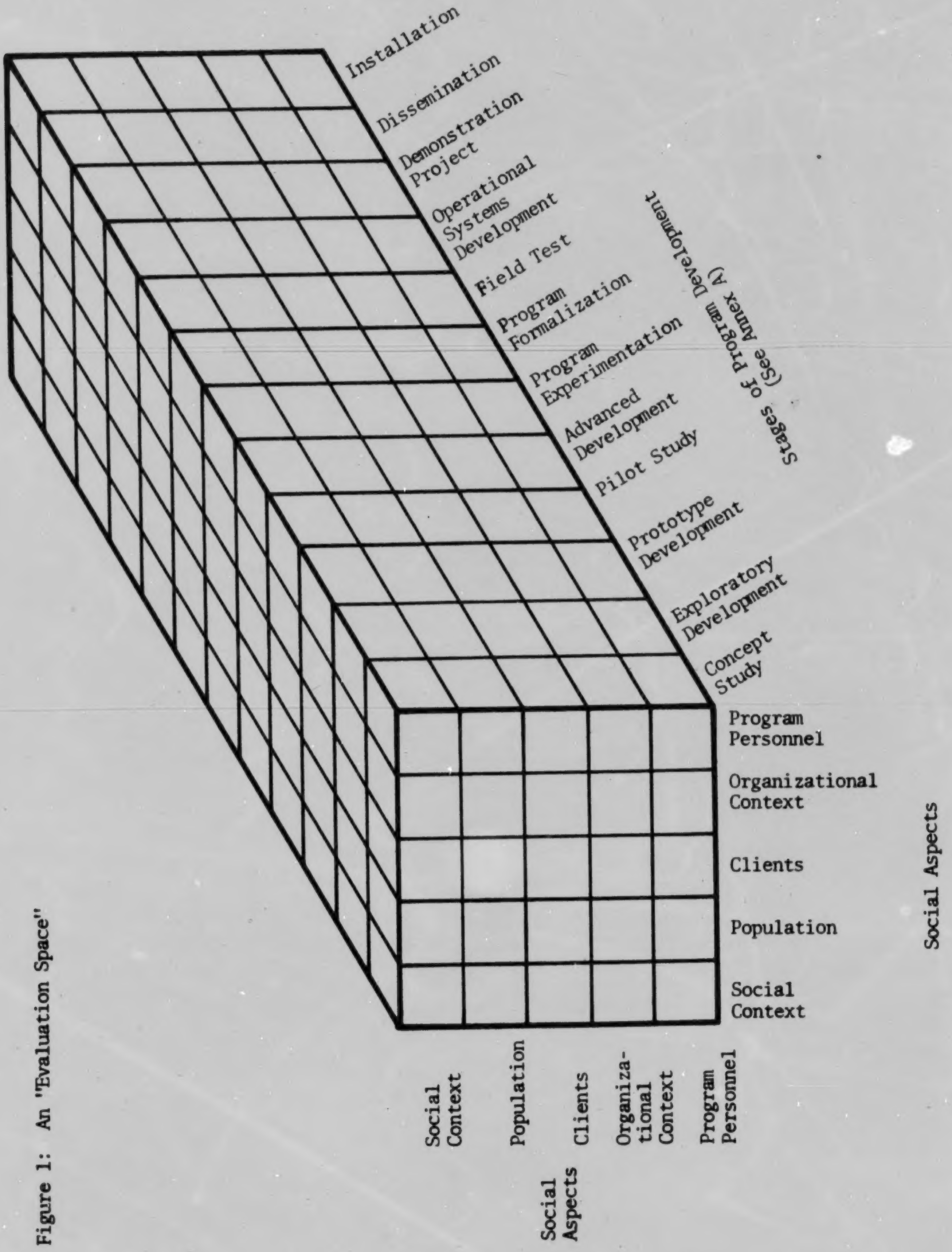

Installation
Dissemination
Demonstration Project
Operational Systems Development
Field Test
Program Formalization
Program Experimentation
Advanced Development
Pilot Study
Prototype Development
Exploratory Development
Concept Study
Stages of Program Development (See Annex A)
Program Personnel
Organizational Context
Clients
Population
Social Context
Social Aspects
Social Context
Population
Clients
Organiza- tional Context
Program Personnel
Social Aspects

Figure 1: An "Evaluation Space"

(libraries, National Film Board, etc.), Entertainment and Cultural institutions (music, arts, drama, movies), Broadcast and Mass Media institutions (commercial and public TV and radio, cable systems, print media--newspapers, magazines, books, etc.), Business and Industry organizations, Legal and Correctional institutions, Transportation and Distribution organizations (post office, public and private transportation), Helping agencies (welfare, manpower, Native societies, John Howard), Nationality-Cultural-Linguistic organizations, Service organizations (Kinsmen, Lions, YM/YWCA, etc.), Medical and Health institutions, and Professional organizations and Unions. If this is not exhaustive, one can get the idea. All of these may be related in complex ways and are in turn related to a given program.

b. Population: This is similar to the social context but includes those individuals who may not be involved in or identified with some type of formal social organization. This includes the total population of people touched, intentionally or not, by a given program and is of particular interest to programs which use mass media in their delivery. The intentional population is usually referred to as the "target population" for a program. Promotional and recruitment activities concentrate in this area although they use parts of the first classification ("Social Context") in their activities. Dissemination of programs can also take place in this sphere although it is mainly concentrated in the "Social Context" area.

c. Clients: This is the sub-group which results from recruitment activities and promotion. They are "processed" in varing degrees in the program (e.g., registration, orientation, treatment/training, discharged/placed/certified, followed up, observed, tested, evaluated, etc.). The selection process results from needs and wants originating from development, evaluation, social institutions, opportunities, etc.

d. Organizational Context: This includes the aspects of the organization which contain the program as a sub-unit. Things like organizational climate, management style, interpersonal relationships among the administrative, support, development, evaluation, technical and implementing staff are included in this area.

e. Program Personnel: This includes the development, evaluation and implementing personnel and the types of interactions and roles they develop as a result of the process of program development.

In the figure, these 5 areas make up the vertical and horizontal axis since they are interactive and interrelated. The third axis arrays the 12 stages of project development described in Annex A.

An ultimate goal for some super-system evaluation expert would be to provide an integrated formative/summative evaluation of a program integrated with progress/achievement evaluation of clients integrated with a feedback and client record system for continual self-correction. This development would be integrated with a system to assess the impact/effect on the larger aspects of the program context.

II. THE EVALUATION SYSTEM OF THE LIFE SKILLS COURSE: AN ILLUSTRATIVE CASE STUDY

A. Introduction

The formative evaluation system eventually developed for the Life Skills Course in 1969-1971 (Lamrock, 1971 and Warren, Lamrock and Himsl, 1971) can serve as an example of a rather primitive system. As a result of struggling with the many problems in our attempts to sort out issues of summative vs formative evaluation, research vs program evaluation plus trying to be of some use for program developers, we made some initial attempts to specify a more general system for developing evaluation systems discussed in Part IV of this paper. Our research training gave us little help at the time except in data gathering and analysis. Had we the benefit of Steele's monograph at the time, we would be much further ahead in this endeavour. However, since our initial attempt (Lamrock, Smith and Warren, 1971) was one of the 50 evaluation models used by Steele to perform her analysis and since we had no time machine, we experienced most of the confusions and conflicts which are described in Part I.

B. Brief Description of the Life Skills Course (from Methods for Human Resource Development, Training Research and Development Station, Prince Albert, Saskatchewan, February 1973, pp. 10-13)

1. The Need for Life Skills Training

Life Skills training seeks to provide disadvantaged adults with the knowledge and skills to demonstrate competence in human relations and in areas of life responsibilities. Life Skills means problem solving behaviours responsibly and appropriately used in the management of personal affairs. A sequence of planned experiences helps students implement a program of personal development in each of the following areas.

Developing Oneself and Relating to Others. Students identify and develop personal strengths and abilities and engage in a balanced degree of self-determinism; they identify, resolve, and obtain help with personal problems; they help each other practise new skills.

Coping with Home and Family Responsibilities. Students identify, resolve, and obtain help with family problems; they learn new skills to improve family life.

Using Leisure Time Purposefully. The students use free time for personal development and social benefit and develop existing or new interests.

Exercising Rights and Responsibilities in the Community. The students learn about the community so they can use resources effectively and for their intended purposes; they learn what contributions they can make for the benefit of self and community.

Making Responsible Decisions for Work Future. The students learn about different occupations and opportunities, and having assessed own interests, aptitudes, and abilities, choose a career goal and plan entry into it, so that through further training and experience, a more meaningful work life can be attained. They learn skills of selecting jobs and practise interpersonal skills related to getting and holding a job.

Life Skills education is an activity program. The adult student actively seeks knowledge through lectures, panels, symposiums, reading, audio-visual aids, discussions, visits and tours. Insight and understanding is gained through feedback techniques, problem-solving groups, task assignments, situational tests and simulated activities. Skills are gained through practical experience, role-playing, drills and demonstrations. Interests are developed through plant tours, audio-visual aids, reading, creativity exercises, role-playing and group discussions. Students gain self-confidence through an observable increase in skill competency based on performance and feedback on performance obtained from other students and analysis of video-tape feedback.

The Life Skills course relates to other courses in that its content and methodologies give students a more realistic insight into their abilities, and provide some skills to handle themselves effectively in new learning situations. These skills and insights provide them with confidence which permits them to learn the basic education skills and the vocational skills needed. The growth in the personal dimension provided by the Life Skills experiences, complements and supports growth on the vocational skill level.

Instead of receiving knowledge passively, the adult student engages actively in deriving, collecting, discovering, and utilizing information to solve problems. He writes, researches, compares, plans, computes, observes, thinks, dramatizes,feels, visits, leads, follows. Only time, imagination of the instructors and students and practicality limit the activities that occur, as the program is life itself. The student's participation in personal goal setting and its modification through subsequent experience, integrates these activities.

2. The Life Skills Lesson

Each lesson has five stages of activity, and a skill objective. The skill objective determines the nature of the activity in each of the five stages. The Life Skills course describes these stages as stimulus, evocation, objective enquiry/skill practice, application and evaluation.

In the stimulus, the coach presents the problem. He does this in different ways depending on the requirements determined by the objective: in one lesson, he shows a film; in another, he uses a case study; in another, a trust exercise. During the stimulus the coach might provoke, might inform, or question; he aims to stimulate discussion among the students.

In the evocation, the coach encourages the students to express their opinions and feelings related to the stimulus. The coach remains non-judgemental assisting students to express their concerns. Students share their knowledge about topic, helping each other to clarify the problem situation. The coach helps the students to classify the ideas given and to define the problem. He helps them formulate fact-finding questions for investigation in the next section.

In the objective enquiry/skill practice phase, the coach acts as a guide. Students seek related new knowledge to the problem they defined; they search for answers to their questions; they practise new skills. In lessons of the first two phases of the course, they might study themselves on video, or use check lists to examine their own behaviour. In lessons of the third phase, in which they study problems related to areas of life responsibility, they might study films, books, clippings from magazines, or they might go out of the training centre to seek information and answers to their questions.

In the application phase of the lesson, the coach helps the student apply knowledge and skills to the solution of a problem. The activities resemble real life situations whenever possible. The real life situation changes as the course develops. In the early parts of the course, the here and now situation is the learning group. In mid-course, the home, the community, or the job become the focus; students interact in the community, invite outsiders in, or plan simulations of real situations.

In the lesson, Exploring Expectations of Employers, employers come to the learning group to participate in a dialogue during the evocation phase of the lesson. In the application phase, each student seeks information at an employer's place of business. The data becomes the subject matter of later lessons, such as Exploring Job Preferences or Applying for a Job.

In the evaluation phase, the students and coach assess how they did and how the lesson helped them. In most lessons, the evaluation is done through discussion, analyzing video-tapes or with a check list. In all lessons, the coach notes the individual student's need for further practice on the skill objective and plans ways to provide this.

In summary, each lesson specifies a skill objective which focuses the lesson activities. The coach brings the student to achievement of the skill objective by the use of a five stage lesson plan: in the stimulus, the coach presents the problem situation; in the evocation the student reacts to and defines the problem, sometimes formally, sometimes not; in the objective enquiry/skill practice the student searches out information and practises new behaviours: in the application, he applies knowledge and skill to the solution of the problems; and in the evaluation, he assesses what was done and how well it was done.

3. Lesson Implementation

In the Life Skills course, the coach uses the techniques of behavior training to produce behavioral change in the students. This requires a precisely stated behavioral objective recognized and accepted by the student. It should carry satisfaction of some sort in its achievement. The coach, or someone else in this behavior oriented learning group, models the behavior if necessary, and the group provides support to the person seeking behavioral change; or if necessary, it may impose sanctions. Evidence indicates that the students find satisfaction and accomplishment in the readily apparent change in behavior and their increased personal effectiveness.

4. Videotape Recording and Playback

Feedback from the group and coach are supplemented by the use of videotape recordings. The testimony of the V.T.R. speaks for itself with indisputable evidence. People see and hear themselves as others see them, probably for the first time in their lives. The V.T.R. gives added force to the feedback which group members provide each other.

5. The Conceptual Basis for Life Skills

The Life Skills Process/Content model integrates three main process dimensions and course content. The course content consists of a sampling of problem situations drawn from life situations; the lesson titles indicate the scope of the content: Handling Drinking Problems, Handling Changes in My Behaviour, Looking One's Best, Relating to Others, Depending on Others, Managing Money, Applying for a Job. The three process dimensions, use of knowledge, use of group, and use of problem solving behaviours, describe the array of skills which Life Skills students use in working with the lesson content. The book, *Readings in Life Skills*, contains detailed discussions of the conceptual basis of the course.

C. The Context of Evaluation in the Life Skills Course

1. The Formative/Summative Evaluation Distinction

Stufflebeam (1968) offered an educational evaluation model which distinguished between "product" evaluation and "process" evaluation. Scriven (1967) offered a similar distinction between what he labels "summative" evaluation and "formative" evaluation. The product-summative phase evaluates the effectiveness of a project after it has run full cycle. Evaluation at this point determines the extent to which the program has met its objectives, or what broader results occurred, etc. In contrast, the process-formative phase provides periodic feedback to those responsible for continuous refinement and development of methods, plans and procedures. The overall objective of formative evaluation is to identify and monitor, on a continuous basis, the potential shortcomings as well as strengths of a project and feed this information back into the project in a relatively short turn around period.

These two types of evaluation are not mutually exclusive or in conflict: formative evaluation does not stop before summative evaluation starts. Formative evaluation is continuous and should be carried on into the summative evaluation stage and summative evaluation provides information for redevelopment. Nevertheless, thinking about program development in terms of summative and formative phases can help determine which evaluative techniques and data collection procedures are most applicable.

Summative evaluation requires the level of control more characteristic of experimental design in contrast, to formative evaluation. Thus under formative evaluation, the evaluator monitors the total situation by using the most sensitive non-intervening data collection devices and techniques obtainable on crucial aspects of the project. Such evaluation is multivariate and does not specify all the important variables before a project is initiated. Because program development is continuous, formative evaluation aims at integrating a number of studies employing different methods of data collection in a total evaluative study. Each of the studies may have special methodological problems but the flaws rarely coincide in all of them and conclusions can be reached by summarizing the results from each.

In general, evaluators have overlooked the opportunity to have real impact on the directions of educational and social change by limiting their evaluation to final (summative) assessment and neglecting formative evaluation. Certainly summative evaluation is necessary, but it is formative evaluation that identifies the need for revisions when the opportunities for revision still exist. It seems better to extract what we can while projects are still fluid than to wait for more definitive findings which too often cannot be used to implement changes.

Formative/summative evaluation integrates different methods into a total evaluative approach: direct observations create a global picture; surveys and standardized tests supply objective data to identify individual and group differences; case studies offer a connected sequence of events to help determine and explain individual and group changes; finally, the experiment provides a controlled test of the effectiveness of specific variables, and the overall research/evaluation design provides for an interweaving of the various methods.

2. An Evaluation Typology

Figure 2 provides a quick overview of how we eventually saw the new (to us at the time) distinctions of formative/summative evaluation as they relate to the more familiar progress/achievement approaches used with students in educational and training situations. If one makes certain arbitrary distinctions (cuts in a continuum) the horizontal and vertical distinctions emerge. On the horizontal axis, there are two Types of Evaluation: "Continuous-Ongoing" evaluation involves a relatively continuous monitoring process with more or less immediate feedback loops built in; "Initial-Terminal" evaluation involves pre-post assessments of change. Turning to the vertical axis of Evaluation Focus, and making certain arbitrary distinctions, one can distinguish evaluation which focuses on students and instructional processes from evaluation which focus on the program, module, or product. These types of evaluation are not mutually exclusive since evaluation of students and instruction is useful for course development. The evaluation focus distinction mainly centers on who is going to use the information and for what purpose.

a. Focus on Students and Instructional Process

(i) Progress Evaluation monitors knowledge and skill acquisition to feedback into the instructional process and is primarily done by the student himself, his peers and the instructor (coach) using evaluation devices built into the program. The Life Skills Course involves daily evaluation. There are scales available for the coach and students to use. There is also spontaneous feedback within the group, student remarks expressed outside the group, and others. In addition each lesson contains a statement of the objectives and provides an evaluation period specifically set aside to assess what was done, how it was done, how it could have been done better, whether or not the objectives were reached and any other matter of concern to the group. About every two weeks each student evaluates the courses he is taking and each coach evaluates his students. These evaluations are used to facilitate student progress and deal with potential difficulties. The course contains specific lessons which review and evaluate progress and provide students and the coach with information on student progress. *Group ratings* are done at various times to detect interaction patterns in the group and determine sub-groups for special skill practice and peer teaching.

(ii) *Achievement Evaluation* assesses student achievement regarding a terminal level of knowledge or skill in order to make decisions regarding pass, fail, and certification. This evaluation is done by coaches and supervisors. More detail regarding the progress evaluation methods is contained in Curtiss and Warren (1973, pp. 199-239).

b. *Focus on Course Development and Refinement*

(i) *Formative Evaluation* involves monitoring the course process to feed back information to the course developers. The evaluation is done by observers, evaluators, developers, instructors and supervisors. The system of formative evaluation described in this section of the paper provided information on a set of course development questions. The evaluation methods included observation by evaluation personnel and lesson developers, evaluating group interviews, a simulated group problem solving test, coach's rating of students on several behaviors, and so on. On the basis of the outcomes of this program of evaluation, the problem solving skills were defined more explicitly and behavioral role and skill training were developed to implement in the course and the coach training course. (See Warren, Lamrock and Himsl, 1971)

(ii) *Summative Evaluation* assesses how well the course works, what does it do? It involves Pre-Post and Follow-Up assessments done by evaluative research personnel.

EVALUATION TYPE

		Continuous-Ongoing	Initial-Terminal
EVALUATION FOCUS	Students - methods, of instructional or facilitation	Progress Evaluation: uses enroute objectives. Monitoring knowledge acquisition and skill development to feed back into the instructional process. Evaluation done by student, group members, instructor, facilitator, etc.	Achievement Evaluation: uses entering assessment and terminal objectives. Assess student achievement or terminal level of knowledge or skill; pass-fail; certification. Evaluation done by instructors, facilitators, and supervisors. May use standardized tests.
	Product - Module, Course, Program	Formative Evaluation: Monitoring the course process to feed back into the course development process. Evaluation done by observers, evaluators, developers, instructors, facilitators, supervisors, etc.	Summative Evaluation: Assess how well the product module, course or program works. What does it do? Pre-Post-Follow up assessment. Evaluation done by evaluative researchers.

Figure 2: An Evaluation Typology

3. Areas of Possible Evaluative Study in the Life Skills Course

Figure 3 provides a schematic representation of the evaluative research context that we eventually became aware of in our process of "boot strap" learning about program evaluation. Do not assume that we in fact did all the glorious evaluation in all the possible domains of evaluation. We finally became aware of the domains as a result of doing the evaluation we did do. (Aumack, 1971, pp. 16-28)

a. Social/Cultural Context. A description and analysis of the total context in which programs are to occur should be done. Particular attention is required concerning factors that might help or hinder the program (e.g., economic, social and political forces). The assessment of total programs treats such information as both cause and effect variables; that is, how does the social context affect the program and what effects might the program have on its context.

b. Potential Clients Characteristics and Situations. Within the total domain of Social Context variables, special attention is given to the "target population" and recipient groups. Information is required concerning the traditional individual characteristics (age, sex, ethnic origin, grade level, etc.) and also the extra-individual or sociological aspects (family, neighbourhood groups, social relations). These aspects may also be considered as cause and/or effect. What is the effect, for example, of a rehabilitation program on the total community where the program is applied? Furthermore, if the program is applied to a small, isolated and homogeneous community what is the effect on the community of removing the best trainees (potential community leaders) via job placement in larger communities?

c. Entry Bridging Systems. The location of a training centre, the quality/quantity of recruiters, and the method of introducing selectees into a program (registration, orientation, etc.) needs to be evaluated. These and related problem areas are of particular concern to evaluation since generalization of results will be intimately related to (and circumscribed by) whatever factors give a selective rather than representative sample of the target population. In addition, the effectiveness of selection and supportive bridging of clients may be reflected in the "no show" and drop-out rate. Bridging systems may deserve attention for purposes other than the controlling of unwanted influences. They may be treated as major elements to be examined, as for example a comparison of a "traditional entry" approach with an "entry plus support" approach. Such comparisons may be of vital concern in programs aimed at "disadvantaged" populations.

d. Organizational Functioning. The analysis of organizations is a specialized area too broad to cover in anything less than a complete book and such books already exist. As a good start, the evaluator might read Etzioni's analysis - the "goal model" vs. "system model" (Etzioni, 1969). The major point to be made is that programs are implemented within some type of organizational context and cannot help but be affected by that context. Well designed programs can be mangled by malfunctioning organizational machinery. The different group variables a program evaluator should consider include: *group composition*, *group structure*, (work, power, communication, and affect structures), *group process*, and *task effectiveness*. These are the more commonly accepted dimensions of group functioning and are dealt with in some detail in most social psychology text books.

e. *Total Training Environment*. The description of formal program procedures is a relatively simple matter. A more difficult problem occurs when a program is actually a complex of sub-programs. A still more difficult task is posed for the programmer and evaluator in relation to informal (incidental, latent, side-effect) influences. Emergent social structures within the student population, teacher-student bonds ("pets"), and after-hours support or training factors may all operate to produce either beneficial or detrimental effects; in some instances, such effects may even exceed the intended program effects. Unless such possibilities are given explicit consideration there is no chance to evaluate the magnitude of their influence.

In-program progress and achievement are basic areas to be assessed by any evaluator of program effects. Here the pre-post assessment process enters but also the progress of a student may be used in a summative manner by developing a cumulative record system which summarizes the progress reports showing changes over time as the result of participating in the program. Thus a study of "progress patterns" could be done on "non-starters", "drop outs", "stop outs", "erratic progressors", "smooth progressors", and "completors".

Evaluation should also be done on *predictors of achievement*. To come up with predictors, the initial assessments must be made as close to the start of a program as possible, preferrably before actual entry. It is possible that a given intervention may have a differential effect on different sub-populations of clients. Unless this is explicitely recognized at the beginning, the pre-program assessment may not provide the necessary information for identifying these sub-groups.

f. *Exit Bridging Systems*. With minor variations, the comments made in relation to entry bridging systems hold here as well. The distinguishing characteristics of "completors" of programs are, of course, crucial for the problem of generalizability. Special emphasis may be put on various types of placement assistance.

g. *Post-Program Life Achievement*. All too few evaluation projects obtain post-program measures of success. Most stop at the point where a client leaves the program. The evaluation of more distant effects is usually seen as an extension of the basic design for evaluating more immediate effects. The difficulty occurs when the different criteria for success within a program and beyond one are usually conceived of as

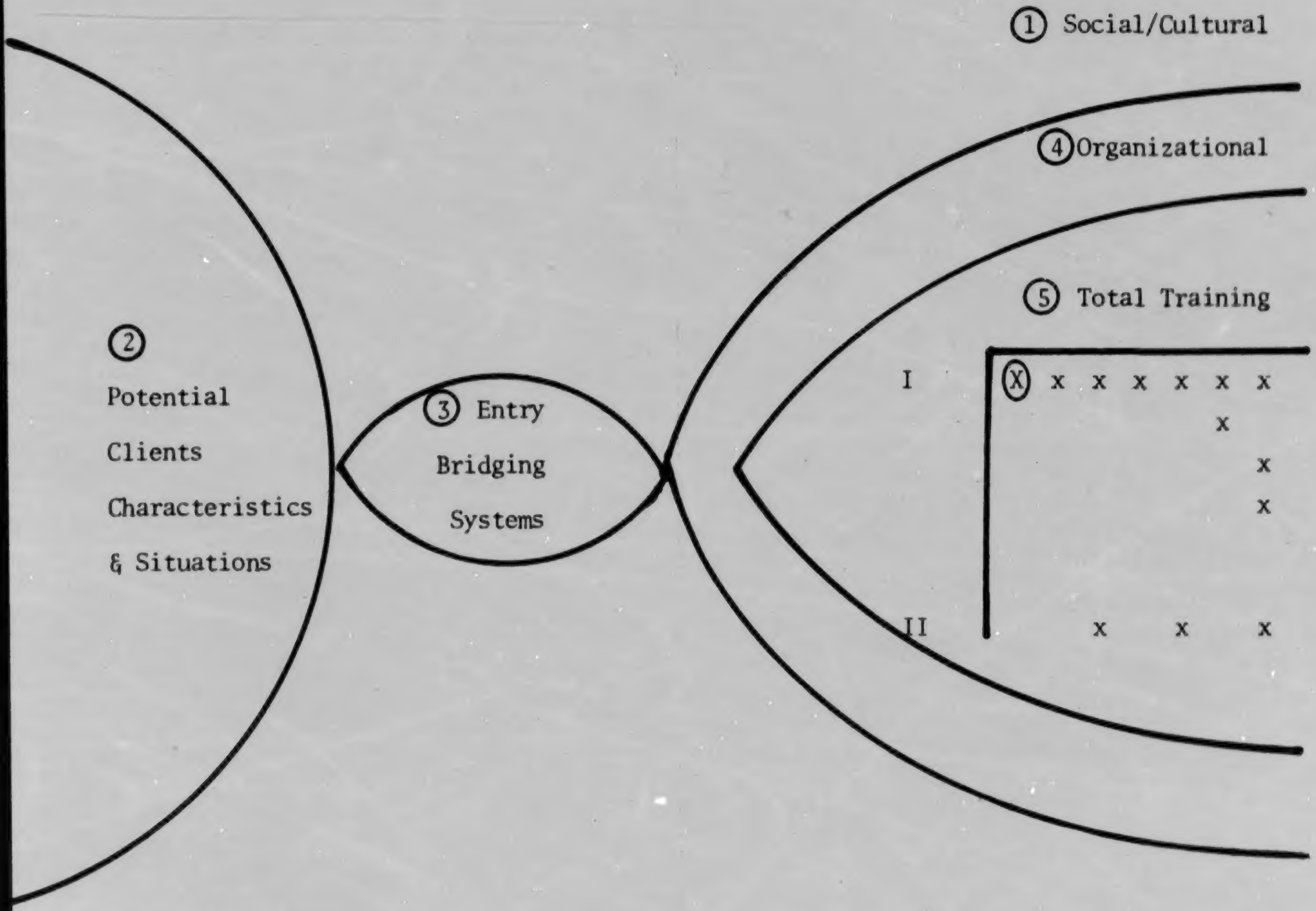
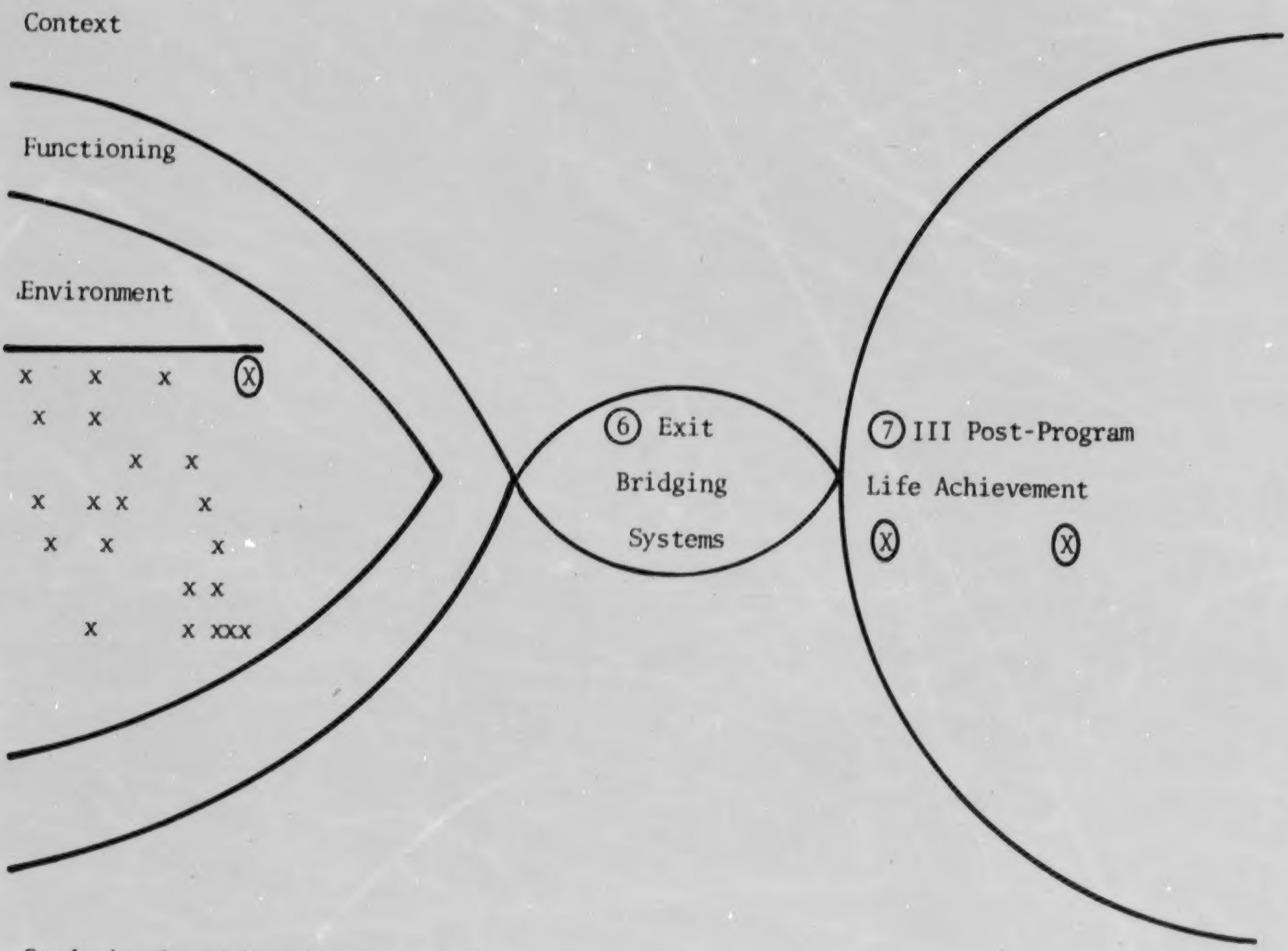

① Social/Cultural
④ Organizational
⑤ Total Training
② Potential Clients Characteristics & Situations
③ Entry Bridging Systems
I
Ⓧ x x x x x x
x
x
x
II
x x x

Figure 3: Areas of Possible Evaluation


Context
Functioning
Environment
x x x Ⓧ
x x
x x
x x x x
x x x
x x
x x xxx
⑥ Exit
Bridging
Systems
⑦ III Post-Program
Life Achievement
Ⓧ Ⓧ

Study in the Life Skills Course

"intervening states" that manifest themselves in either muted or extended fashion over time. Thus an increase in academic skills on program may be expected to increase the likelihood of a student's employability or salary level after leaving the program (distant effects). Obviously a readministration of tests to measure academic level is relevant for assessing post-course effects but irrelevant for a follow up. On the other hand, a program aimed at improving a student's social involvement and participation may use measures equally appropriate for pre-program, in-program and post-program evaluations (e.g., number of meetings attended, number of contacts with the opposite sex, voting vs. no-voting). These are problems of criterion evaluation. Early in the development of an evaluation system, the explication of criterion measures is of major importance. In many program evaluation attempts the criterion problem is by-passed with gross, vague and stirring propagandistic slogans. By the time it is given serious attention toward the end, it can only become subordinate to the program. The basic intent of most programs, however, is to affect a certain change in behaviour or conditions and to this end one develops what are presumed to be relevant programs. It is to the advantage of both program developers and evaluators to make as explicit as possible the objectives of the program in terms of follow up assessments.

4. "Zones" of Evaluation of Program Results

a. Zone I: Study of Course Effects in the Learning Laboratory

The training environment provides a comparatively safe setting in which to acquire and use new skills and information. Within this environment there is an attempt to approach the "real world" by the use of various simulations, role playing and "games" being the primary techniques. "Formative evaluation" discovers whether or not the instructional methods are producing the desired result on course, providing information on what works with whom, what additional training the coaches (instructors) require, what revisions in the course must be done to produce the desired result (e.g., lesson changes, sequencing changes, added lessons, substituted lessons, needed training techniques, etc.) and other modifications while the course is going on. "Summative evaluation" provides information on the total impact of the course however modified it may have been.

b. Zone II: Applications in "Real Life"

Evaluation procedures must also study the course effects outside of the learning laboratory conducted while the course is still in process. This field work, while difficult and time consuming, is necessary to check on any transfer of skills and knowledge acquired in the laboratory.

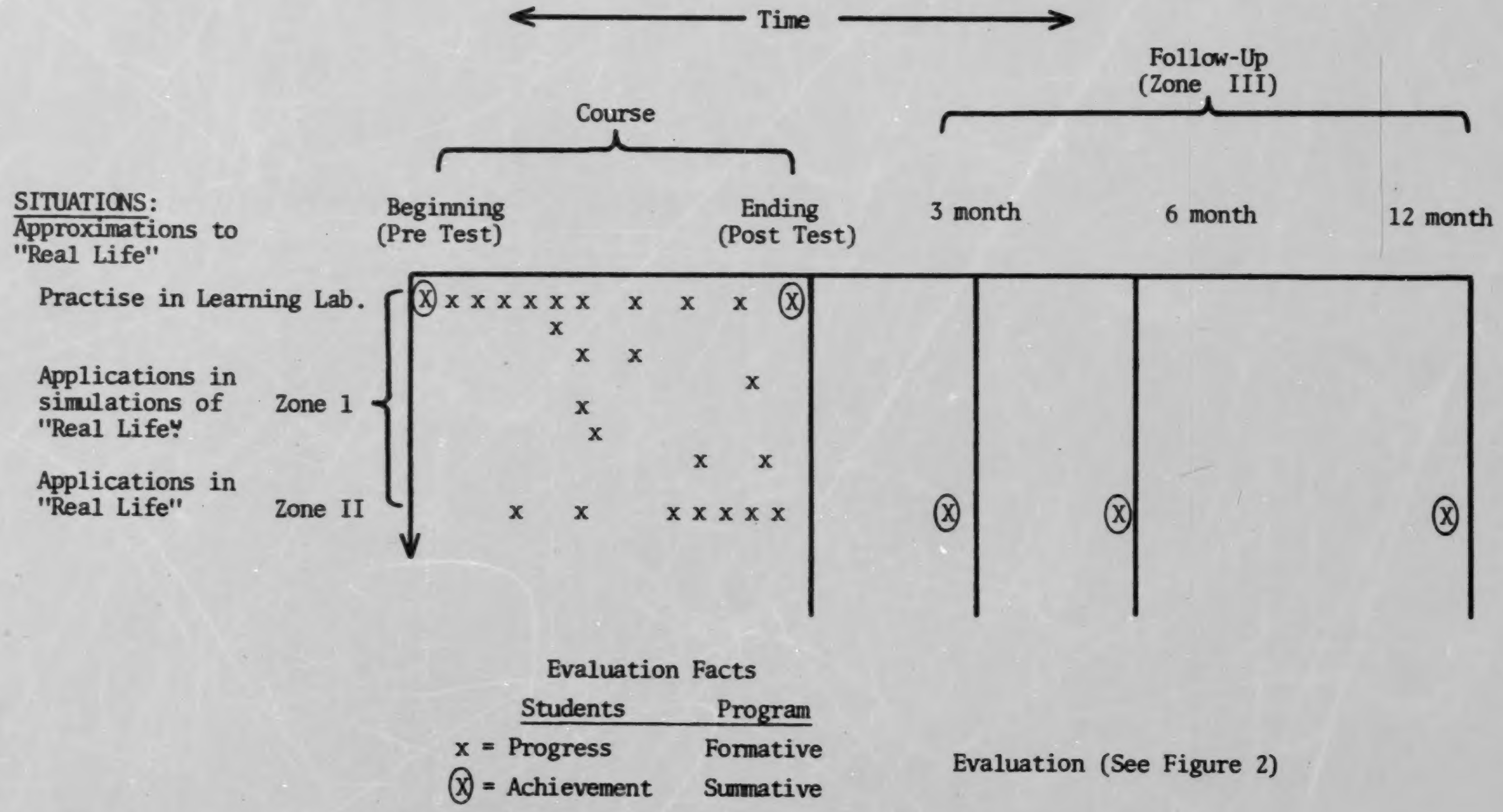

Time
Course
Follow-Up
(Zone III)
SITUATIONS:
Approximations to
"Real Life"
Beginning
(Pre Test)
Ending
(Post Test)
3 month
6 month
12 month
Practise in Learning Lab.
Applications in
simulations of
"Real Life"
Zone 1
Applications in
"Real Life"
Zone II
Evaluation Facts
Students
Program
x = Progress
Formative
Ⓧ = Achievement
Summative
Evaluation (See Figure 2)

Figure 4: Points of Evaluating Skill Transfer Across Situations and Time

The ultimate test of the effect of the Life Skills Course involves how much application occurs outside the training context. Each lesson has an application phase which, especially later in the course, involves doing something "outside". This provides the initial test of the effect of the course. If there is no transfer of skills and knowledge outside the learning laboratory then the goal of the course has not been achieved. If there is no transfer during the course, then there is little likelihood that there will be transfer after course completion. Thus, data must be gathered from several sources as to how much transfer occurs in the various areas and how much occurring on each lesson is appropriate.

c. Zone III: Post Course Evaluation - Follow Up Study

No evaluation procedure can be considered adequate if there is no follow up of the effects of the course. Interview and evaluation procedures have been developed for the follow up evaluation using the opinions of course graduates and thus we obtain their opinions of the impact of the course after given periods of time (see Curtiss and Warren, 1973, pp. 196-239). If there is a heavy emphasis on the transfer of skills into the real world throughout the Life Skills Course, then it is hoped that the continued use of life skills will follow quite naturally and will not be a sudden transition from the safe learning environment to the hard realities of life. Thus, the success of transfer while on course to the post course transfer should be compared. This study involves considerable time and effort but is essential to any evaluation process.

D. Program Development Questions

As a result of increased experience in program development, we became more sophisticated and systematic in our approach. Thus, we formulated several questions with respect to the redevelopment of the course. While still at a rather general level, they did help focus the data gathering process. When these general questions were formulated the data gathering methods could be related to the questions to see that all areas were covered (see Table 2). The questions were:

a. Which of the behavioral changes specified for the students actually occur as a result of the course?

b. What behavioral changes actually occur as a result of the course, but are not specified in the objectives?

c. In what respects does the Life Skills Course fail to provide the opportunity necessary for the students to achieve the specified behavioral changes?

d. What changes specified for the course are a function of time (no training)?

e. Does academic upgrading only result in the same behavioral changes as those specified in the Life Skills Course combined with the Basic Education Course?

f. Assuming that Life Skills students have expectations for a "traditional learning setting", will the provision of such a setting result in more efficient development of specified behavioral change?

g. How do the techniques of skill training produce specified behavioral changes more efficiently than those techniques in the present Life Skills Course?

h. In what ways does the precision required for the implementation of the techniques of skill training refine the definition of the behavioral objectives in the Life Skills Course?

i. In what ways do the written lesson materials fail to give adequate guidance to the coach for effective lesson implementation (timings, sequence of lessons, clarity of direction, completeness of direction)?

j. What skills do the coaches lack in order to objectively achieve behavioral change in students?

E. Life Skills Evaluation Methods and Procedures

The evaluation system developed for the Life Skills Course had as its principle objective the development of the course (i.e., it was formative and process oriented). Thus observation procedures, ratings, scales, check lists, role play, and simulations were used to assess student progress and skill levels so that course developers could refine and strengthen the course.

Several methods for collecting data were developed and a flow chart for each method specified. How these various methods fit together in an integrated manner has not been made explicit (i.e., the evaluation system was not an integrated one). It should be pointed out that each evaluation method used to monitor the process could also be used in a summative manner by plotting changes within the course and summarizing these changes. Not included in this description is a system of progress reports using both student and coach ratings on several aspects of the course. (See Curtiss and Warren, 1973, pp. 199-239 for the various measures developed to assess student progress which grew out of the formative evaluation system described here.)

TABLE 1: Results of Observers' Categorization of Behaviors According to the Life Skills Process/Content Model

Dimension	% of total responses (N = 2034)
Use of Knowledge	30.5
cognitive	.5
affective	3.5
psychomotor	26.5
Use of Learning Group	38.7
safe	21.5
careful	12.2
risky	5.0
Problem Solving	30.8
not relevant to p/s	25.8
problem not dealt with	4.3
recognizes problem	.7
defines problem	0
chooses alternative	0
implements alternative	0
evaluates alternative	0

The course changes recommended as a result of the formative evaluations are discussed in Warren, Lamrock and Himsl, 1971.

1. Observation (see Figure 5)

a. Purpose. To identify behaviors which occur in response to specific lessons, coach and other student behavior.

b. Criteria. The behaviors must be observable: word, movement, facial expression, body attitude, associations with other persons in the learning group. The observer does not rate the quality of a behavior; he notes only its presence and in the report, offers an interpretation of the behavior.

c. Decisions. The coach may use these records to modify his coaching behaviors to bring about desired changes in his group. He uses these immediately. The lesson developer uses the records to substitute new directions in the written lesson materials or to add new directions if he can establish the relevance between the noted behavior and the lesson. These observations provide the empirical basis for the description of the theoretical Life Skills Process/Content model (Readings in Life Skills, 1973). These observations will determine the retention and modification of the model.

d. Procedure. The evaluation specifications for Intake K called for one observer of each training group for all training sessions. Due to personnel constraints, however, only one group was observed on a regular basis. Since the emphasis was on developing the methodology and validating the Life Skills Process/Content Model (Readings in Life Skills, 1973), it was felt that this activity would be useful even though the data necessary for making group comparisons could not be obtained. A behavior analysis which reflects behaviors expected in the lesson was used as a guide by the observer. He recorded a summary of behaviors exhibited by each group member at the end of each session.

The observer watched all training sessions for one of the four sub-groups of Intake K for a period of two months. During the lessons all the behaviors manifested by the students were recorded. These behaviors were then categorized along three dimensions of the Life Skills Process/Content Model.

e. Results. Table 1 summarizes the observers' weekly report for the period of November 23, 1970, to December 17, 1970. The observers attempted to classify each behavior on each of the three dimensions of the model. As can be seen in Table 3, 30.5% of the total observations were assigned to the Student Use of Knowledge Dimension, and 30.8% to the Problem Solving Dimension. Of the total number of observations assigned to the latter dimension, 25.8% were assigned to the "not relevant to problem solving" category. This seemed to indicate the inability of the observer to detect problem solving behaviors when

TABLE 2: Relationship Between the Development Questions and Evaluation Procedures

✓ = evaluation procedure provides information to answer development questions

	EVALUATION PROCEDURES									
	Observation	Diag./Persc.	Gr. Develop.	Lesson Eval.	Training Sup.	Rate Students	Inf. Remarks	Gp. Interview	P & P Tests	Sim/Prob/Solv
DEVELOPMENT QUESTIONS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10
a. Which behavioral changes specified for the students actually occur as a result of the course?	✓	✓	✓	✓		✓		✓	✓	✓
b. What behavioral changes occur as a result of the course, but are not specified in the objectives?	✓	✓	✓	✓		✓	✓	✓		✓
c. In what respects does the L/S Course fail to provide opportunity for students to achieve the specified behavioral changes?	✓	✓		✓	✓		✓			
d. What changes specified for the course are a function of time (no training?)									✓	✓
e. Does academic upgrading only result in the same behavioral changes as those specified in the L/S Course combined with the Basic Education?									✓	✓
f. Assuming that L/S students have expectations for a "traditional learning setting," will provision of such a setting result in more efficient development of specified behavioral change?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
g. Do the techniques of skill training produce specified behavioral changes more efficiently that techniques specified in L/S?	✓	✓	✓		✓	✓	✓	✓	✓	✓
h. In what ways does the precision required for implementation of skill training refine the definition of the behavioral objectives in the L/S Course?	✓	✓	✓	✓	✓		✓	✓		✓
i. In what ways do the written lesson materials fail to give adequate guidance to the coach for effective lesson implementation.	✓	✓	✓	✓	✓		✓			
j. What skills do the coaches lack in order to objectively achieve behavioral change in students?	✓	✓		✓	✓		✓			

used by other people. Attention turned to the resolution of this difficulty.

Four observers studied a videotape of a Life Skills group in a problem solving session, and using the same observation schedule, made independent classifications of the behaviors observed. Although the different observers found problem solving behaviors, they could not consistently classify them into one of the five broad categories depicted on the Model. As a consequence of this information, the Problem Solving Dimension, conceptually described as having 5 phases, was further defined by more precise behavioral descriptions of the problem solving behaviors which they subsume and the conceptual development of the course was enlarged to account for the apparent fact that the same behavior could at one time be used to define a problem, at another time aim at choosing a solution, and at still another time be a part of the application.

2. Coach's Diagnosis/Prescription For Behavior Change (see Figure 6)

a. Purpose. To permit the coach to specify which skills need emphasis for each student, and to specify the technique to bring about the desired behavior.

b. Criteria. The coach's dissatisfaction with the development of a particular skill by a student and his own ability to bring about the change.

c. Decisions. The coach modifies his behavior according to the need implied by his observations.

d. Procedure. After each training session the coach identified a "coach's remedying behavior" needed to bring about a behavioral change in the student. He implemented his plan in the next session, after which he assessed its effectiveness. The evaluation form was completed each day during the first month of training.

e. Results. The requirements of the evaluation form used identified the coach's inability to diagnose skill failure and to devise corrective instructional plans. It also revealed that the coaches often lacked the instructional skill of insisting on adherence to a behavioral commitment. As a result, modifications of the coach training course placed greater emphasis on the diagnosis of skill failure and introduced some techniques of behavior modification methodology, e.g., "the pin point behavior", "set goal", and "record progress" sequence (see Curtiss and Warren, 1973).

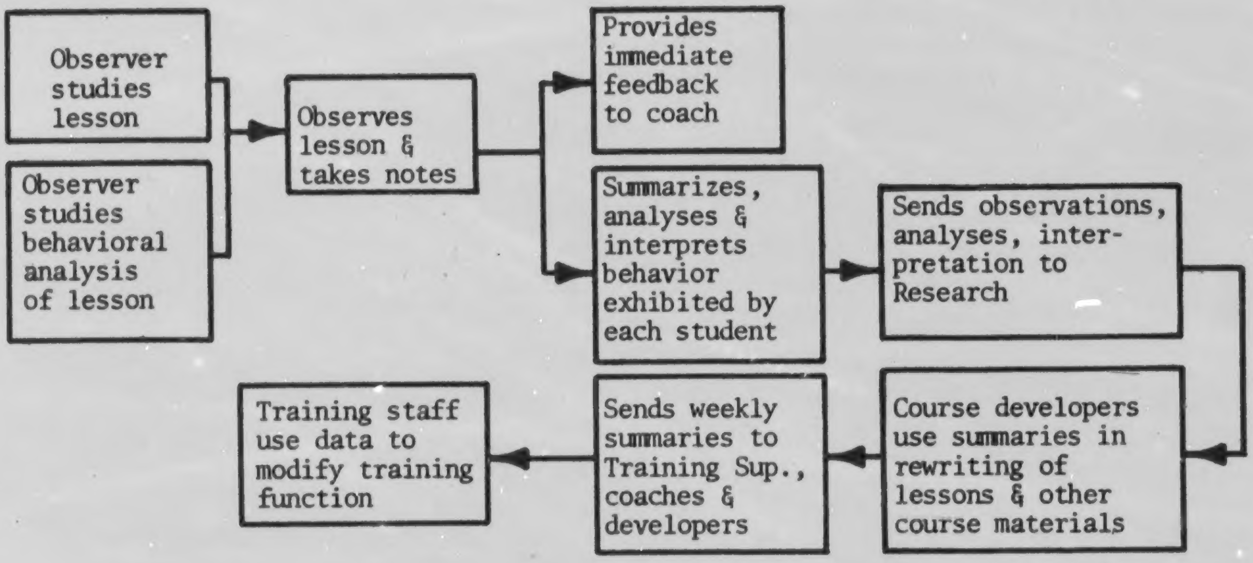
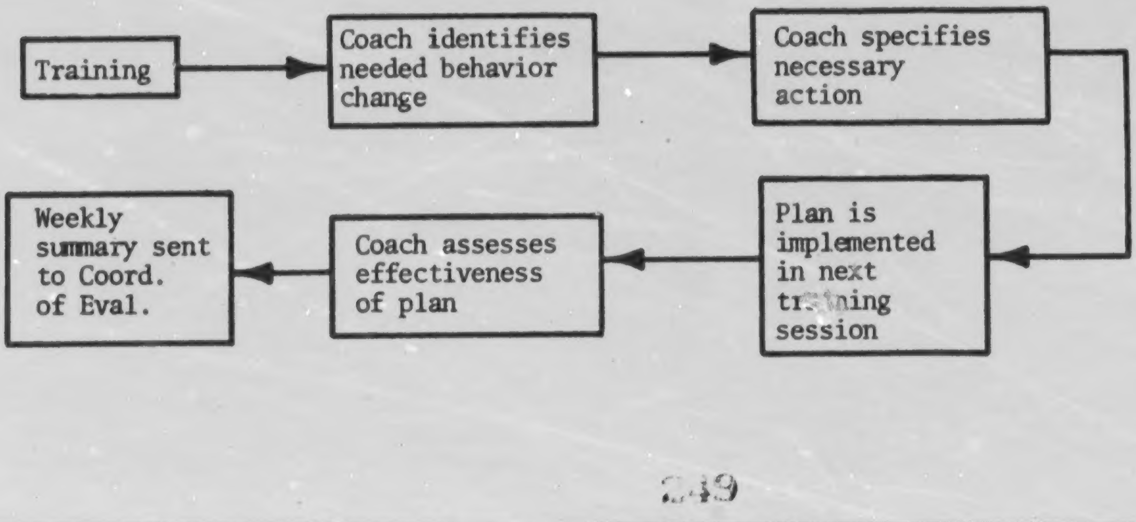

Observer studies lesson
Observer studies behavioral analysis of lesson
Observes lesson & takes notes
Provides immediate feedback to coach
Summarizes, analyses & interprets behavior exhibited by each student
Sends observations, analyses, interpretation to Research
Course developers use summaries in rewriting of lessons & other course materials
Sends weekly summaries to Training Sup., coaches & developers
Training staff use data to modify training function

Figure 5: Flow Chart for Observation

Figure 6: Flow Chart for Coach's Diagnosis/Prescription for Behavior Change


Training
Coach identifies needed behavior change
Coach specifies necessary action
Plan is implemented in next training session
Coach assesses effectiveness of plan
Weekly summary sent to Coord. of Eval.

3. Coach's and Observer's Evaluation of Group Development in Interpersonal Relations Skills (see Figure 7)

a. Purpose. To evaluate and improve interaction of group members.

b. Criteria. The subjective estimate of "group development" on specified scales of interpersonal relations skills as defined in the scale descriptors.

c. Decisions. To change coach behaviors, lesson sequence, etc., to facilitate group development basic to individual development.

d. & e. Procedure and Results. This short rating form permitted the coach and other observers to quickly assess the general level of competence and skill of the group as a learning/helping group. However, this form was little used and thus did not generate much information.

It was revised, integrated with other progress assessment measures and included in subsequent coach training (see Curtiss and Warren, 1973, pp. 199-239).

4. Observation By Lesson Developers (see Figure 8)

a. Purpose. To allow the course developers to assess the effectiveness of the course materials.

b. Criteria. Coach and student expressions of satisfaction with lesson content and procedures; the developer's satisfaction that instructors and methodologies are sufficiently explicit.

c. Decisions. To eliminate weak or wrong instructions in the lessons. To decide on the relevance of a lesson topic and its sequencing.

d. Procedure. After each session the observer recorded his comments on the quality of direction and general adequacy of the written materials. Several course developers observed Intake K. They recorded their observations and recommendations and sent the reports to the Supervisor of Development who directed their use in the lesson redevelopment.

e. Results. It was found that reporting on specifics of the written materials (clarity, timings, sequencing, completeness of directions) became confused with reporting the coach's expertise in giving the lesson. One could identify comments related to the instructional plan itself, but often little was left when comments on coaching were extracted. It was recommended that the coach and observers distinguish between comments

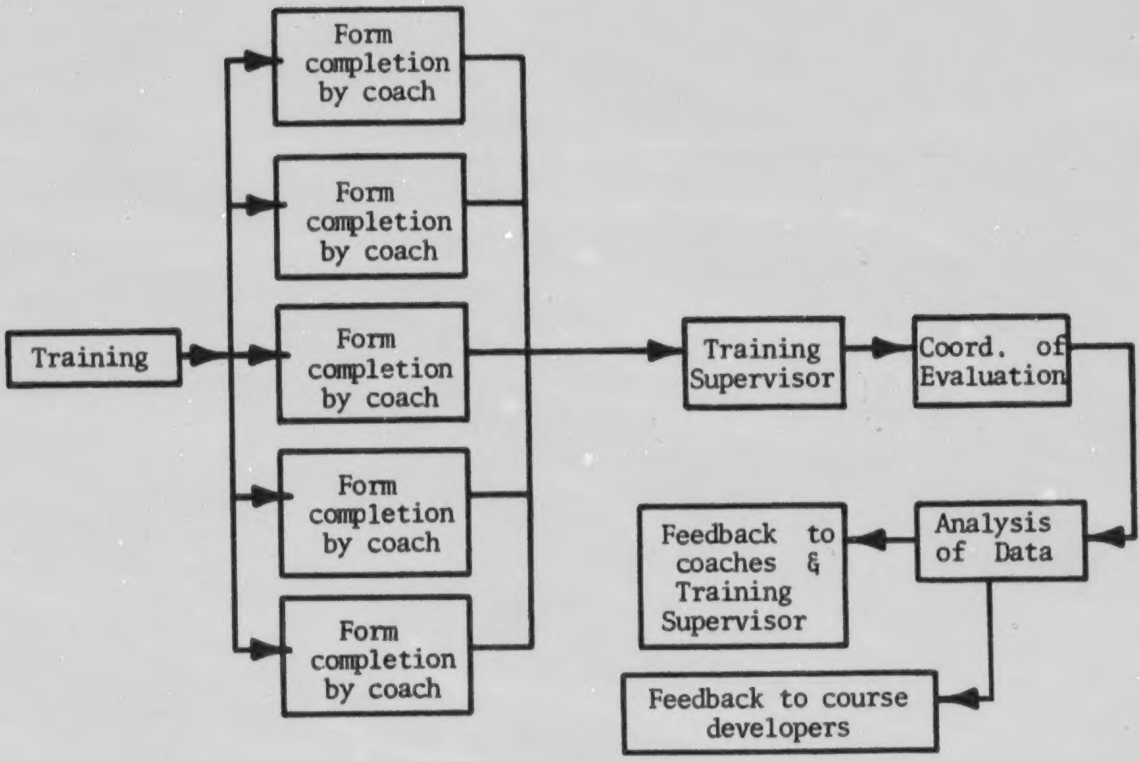

Form completion by coach
Form completion by coach
Training
Form completion by coach
Form completion by coach
Form completion by coach
Training Supervisor
Coord. of Evaluation
Analysis of Data
Feedback to coaches & Training Supervisor
Feedback to course developers

Figure 7: Flow Chart for Evaluation of Group Development in Interpersonal Relations Skills

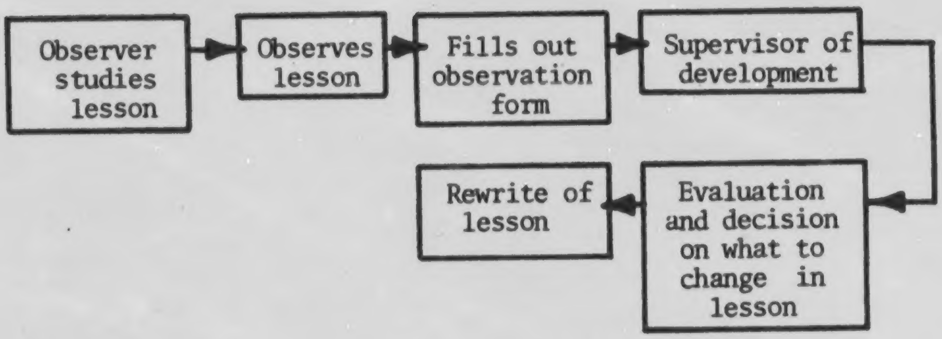

Observer studies lesson
Observes lesson
Fills out observation form
Supervisor of development
Evaluation and decision on what to change in lesson
Rewrite of lesson

Figure 8: Flow Chart for Observation by Lesson Developers

on coaching and those on the written instructional plan. Also, departures from the written plan were to be recorded in more detail so that the developers knew the reasons: e.g., group interest, special problems with the group, preference of the coach, directions not clear, etc.

The observers' reports indicated that although the lessons provided skill objectives, frequently the level of achievement of the skills was not specific enough. Also, the reports revealed a need for greater skill practice in order to facilitate transfer of the skills learned. As a result of this information, the Life Skills lessons now include opportunities for the students to teach their newly acquired skills, in order to facilitate skill training transfer.

5. Training Supervisor's Summary of Coach's Daily Evaluation (see Figure 9)

a. Purpose. To document additional information which may result from meetings between the training supervisor and coaches and provide a method for supervisors to record their evaluations.

b. Criteria. The comment has an evaluative quality; it refers to student progress, quality of lesson materials, or satisfaction with the development of the group.

c. Decisions. Training supervisor can determine the effectiveness of the approach of the coach under an array of circumstances. Areas of concern to which the Life Skills Course does not address itself can be determined.

d. Procedures. After each training session the coach met with the training supervisor to discuss the progress of the group and these comments were recorded along with any other comments the supervisor may have had.

e. Results. The supervisor's summary of these meetings was forwarded to the evaluation section but these summaries were found to contain little information not gained by other methods and thus were discontinued.

6. Coach's Rating of Students (see Figure 10)

a. Purpose. To document individual student progress over time.

b. Criteria. The presence of certain specified behaviors believed to be important indices of individual development.

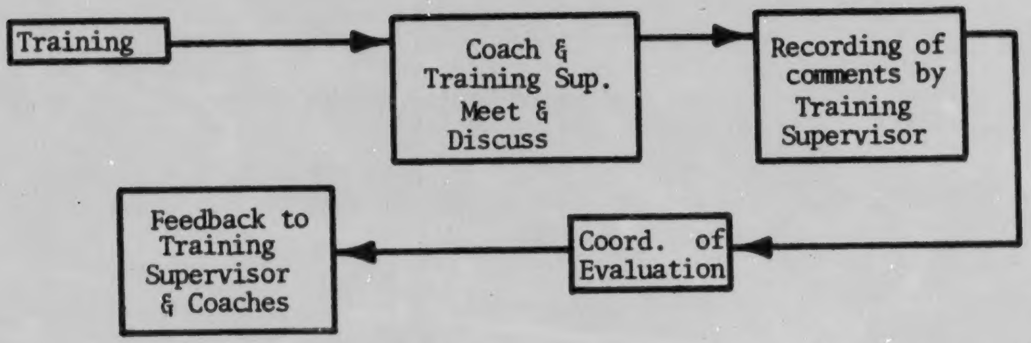

Training
Coach & Training Sup. Meet & Discuss
Recording of comments by Training Supervisor
Coord. of Evaluation
Feedback to Training Supervisor & Coaches

Figure 9: Flow Chart for Training Supervisor's Summary of Coach's Daily Evaluation

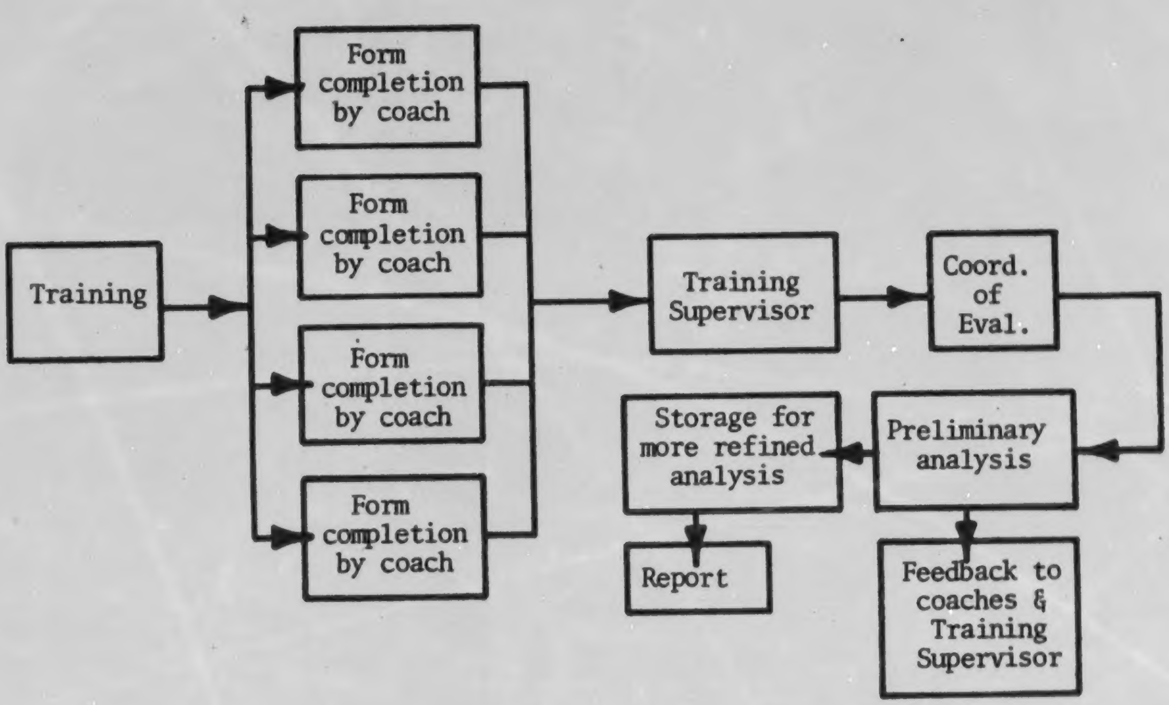

Training
Form completion by coach
Form completion by coach
Form completion by coach
Form completion by coach
Training Supervisor
Coord. of Eval.
Preliminary analysis
Storage for more refined analysis
Report
Feedback to coaches & Training Supervisor

Figure 10: Flow Chart for Coach's Rating of Students

c. Decisions. The coach determines which behaviors need more emphasis for each group member. The developer can recommend to coaches effective coaching behaviors by specifying them in rewritten lessons.

d. Procedure. The form, "The Rating of Life Skills Students by Coaches", allows the coach to document progress. The form includes a list of over 30 behaviors considered indices of both group and individual progress. (See Curtiss and Warren, 1973, pp. 194-239.)

e. Results. The first completion of this form was three weeks after the beginning of the course (Intake K). The compilation of results permitted the coaches to compare the standings of individuals within the group. This report revealed to the coach where the groups needed more training. The analysis of the results of subsequent forms permitted the coach to assess individual and group progress. The coaches found this information useful in guiding their instructional emphasis.

7. Recording of Informal Remarks (see Figure 11)

a. Purpose. To capture remarks about training progress which may be made in an informal setting and will therefore often escape the more structured methods of data collection.

b. Criteria. The comment must be either spoken or indicated clearly in a non-verbal manner; preferably a voluntary remark.

c. Decisions. To decide on the need for further investigation and to assist in assessing other data.

d. Procedure. Frequently people make evaluative remarks regarding group process in an informal setting. These remarks are recorded in a diary for subsequent analysis.

e. Results. The procedures were not implemented and therefore did not yield any information.

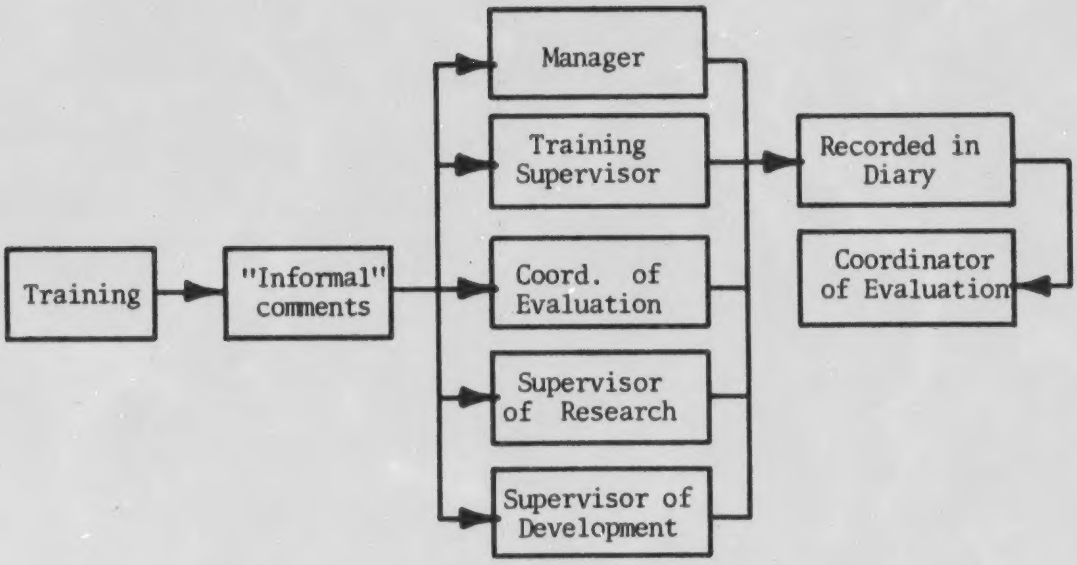

Training
"Informal" comments
Manager
Training Supervisor
Coord. of Evaluation
Supervisor of Research
Supervisor of Development
Recorded in Diary
Coordinator of Evaluation

Figure 11: Flow Chart for Recording Informal Remarks

8. Rating of the Interview of the Group (see Figure 12)

a. Purpose. To provide a means by which a skilled interviewer can evaluate the skill of the coach and the progress of the group using the whole group's evaluation of these areas.

Because all four groups of Intake K could not be observed, other methods were devised to obtain comparisons of the possible effects of coaching styles on group progress as required by development question "f" (see Table 2). For this purpose an interview of each group was done by the Supervisor of Training for Life Skills. The suggested interview guide instructions, together with the form used for the ratings, served as the definition of the dimensions to be assessed.

b. Criteria. The judged quality of coach performance and group development as defined by the rating scale descriptors.

c. Decisions. The Supervisor of Training made recommendations on any necessary changes to strengthen weaknesses and further group development and help the coach become more effective.

d. Procedures. The skilled interviewer was provided with the interview guide along with the rating forms, and instructed to devise a group interview which would last no more than 1 1/2 hours and which would provide an indepth probe of the designated dimensions. This interview was done on the afternoon of December 23, 1970 with two groups. In both cases the interview was done in a smooth and probing manner and succeeded in covering the required areas thus allowing meaningful ratings to be made. Three observers watched the interview from the observation room and made notes and did their ratings there. The interviewer (Supervisor of Training), made his ratings after both interviews were completed. In addition, each coach watched his group being interviewed and also did the ratings although these are not used in the analysis.

e. Results. The attempt was made to measure the extent to which the two groups were rated differently by the 4 raters on 9 dimensions. The statistical test used was the Mann-Whitney U test (a non-parametric equivalent of the "t" test; Siegel, 1956) and although the analysis is not strictly appropriate, it provided a rough indication of whether or not these two groups were rated differently. The hypothesis tested was that "teacher style" group and method was equal to or better than the "Regular Life Skills" group and method as measured by these ratings. This was the case and it was significant at the 10% level or better on each dimension.

f. Interpretation. The meaning of these results was ambiguous. The study gathered data to answer the development question "f" (see Table 2) regarding using a "teacher" style of coaching versus the present Life Skills coaching method. Assuming no other difference between groups and equally competent coaches, the data supported the idea of initially providing a didatic style of coaching. This interpretation was made ambiguous by several complicating factors: two coaches of different sex used two styles on two different groups. Any one of these singly or in combination could produce the differences. In fact, the two groups were initially significantly different on three derived scales of the 16 PF: the group rated higher was also significantly less anxious (means of 4.6 vs 5.2, t = 2.15), more mentally healthy (5.6 vs 4.6, t = 1.85) and showed greater capacity to learn (6.2 vs 5.7, t = 2.11). This fact alone could produce the rating differences observed in this study. In addition, the two styles of coaching did not differ so much on directiveness as in type of directiveness. The general impression was that the female coach was more subtle in her directiveness, whereas, the male coach was more direct, overt and obvious. The most that could be concluded was that an initial didatic approach to Life Skills was not detrimental to group development and was compatible with the desirable outcomes described in the form, "Evaluation Form For Group Development: Interpersonal Relations Skills". As a result of the above information, it was concluded that the coaching style could become more overtly directive, requiring the students to do the activities and use the skills in and out of class, but coaches needed to be trained for this. The use of the group interview method for assessment has many drawbacks from a pure assessment point of view. However, with a skilled interviewer, it could be quite useful to provide a supervisor with a comparative assessment of groups and coaches and the approach could be usefully incorporated into a supervisor training program.

9. Simulated Group Problem Solving Test (see Figure 13)

a. Purpose. To measure the adequacy of the Life Skills Course in developing problem solving skills and to provide a diagnostic technique which can be used to develop problem solving skills in students.

This was an evaluation method developed to assess the comparative progress of groups. Again, this was done since observation of all groups was not possible and some method was needed to measure progress. In addition, the technique could be a useful one to incorporate into the course format as a periodic progress check.

b. Criteria. The judged quality of the students' problem solving skills as defined by the rating scale descriptors.

c. Decisions. To pinpoint the behaviours each student needs improvement in and to develop a plan of remedying actions for the coach to implement. To determine the progress of students and groups which can be used in deciding about further training or recycling in training.

d. *Procedure*. On Thursday P.M., January 7, 1971, each of the Life Skills groups were presented with the instructions and case study as a test of their individual and group problem solving skills. In addition, for comparison, the matched control group was tested on Wednesday evening, January 20, 1971, and were told that this test was given to the training groups at NewStart to see how well they could do without any training. They were then treated like the training groups. The situation was described in the instructions handed to the groups and read. Any questions they had were answered and when the groups were satisfied that they understood what was required of them, the case study, "Fred", was handed out to them. Each group was V.T.R.'ed and the tapes were to be analyzed by two raters.

e. *Results*. The formal analysis of the tapes using the scales and developed descriptors was not done to completion since all groups performed so poorly that virtually no problem solving behaviours were exhibited. Informal analyses were made of the tapes by various people and a meeting was called to view, analyze and develop remedying behaviours for coaches to try to make their groups more skillful. As a result of this test the training methods in helpful and problem solving behaviours were refined and re-conceptualized with lessons added for this purpose. Also, the technique developed for evaluation was refined with several improvements in the evaluation instrument.

10. *Pencil and Paper Tests* (see Figure 14)

a. *Purpose*. To isolate student characteristics related to progress and to document personality/attitude changes thought to be due to the effects of the Life Skills training.

b. *Criteria*. The scores students achieve on specified pencil and paper tests prior to training and on the completion of the Life Skills Course.

c. *Decisions*. To decide the test scores which reliably predict success for prospective Life Skills students. To identify which changes in attitude, etc., as reflected by test scores, occur as a result of the Life Skills Course.

d. *Procedure*. A number of tests were identified as useful in determining personality changes which was judged relevant to the objectives of the Life Skills Course. Some of these tests were revised for use with our population and were administered pre and post course.

e. *Results*. A preliminary report exists in *Readings in Life Skills* (pp. 241-252). A more detailed report is in preparation. Since this constitutes a "summative evaluation", it is not included here.

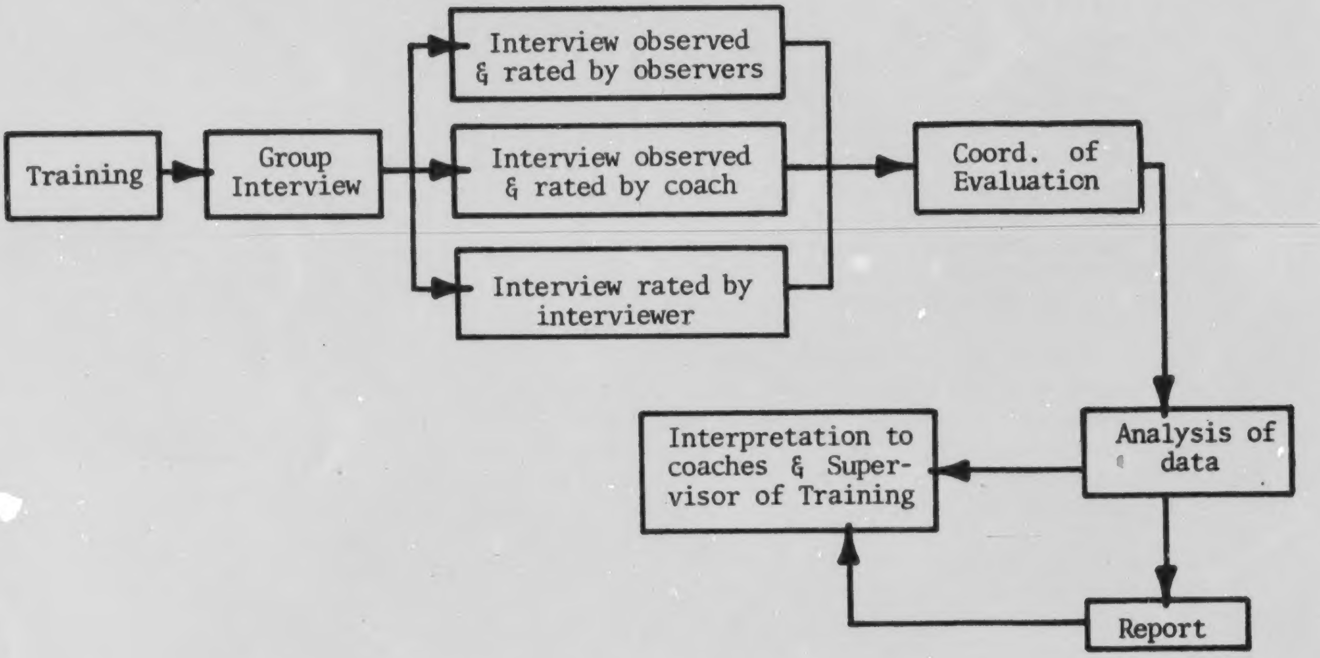

Training
Group Interview
Interview observed & rated by observers
Interview observed & rated by coach
Interview rated by interviewer
Coord. of Evaluation
Analysis of data
Interpretation to coaches & Supervisor of Training
Report

Figure 12: Flow Chart for Rating of Interview of Group

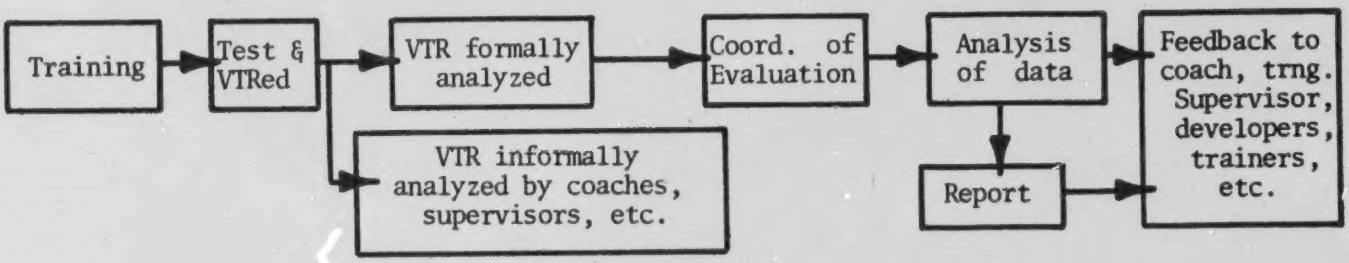

Training
Test & VTRed
VTR formally analyzed
VTR informally analyzed by coaches, supervisors, etc.
Coord. of Evaluation
Analysis of data
Report
Feedback to coach, trng. Supervisor, developers, trainers, etc.

Figure 13: Flow Chart for Simulated Group Problem Solving Test

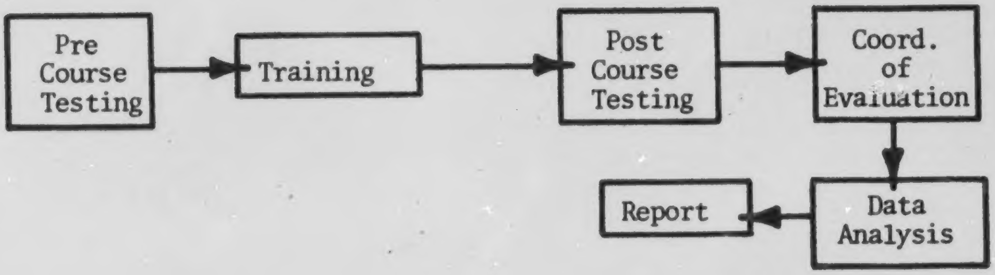

Pre Course Testing
Training
Post Course Testing
Coord. of Evaluation
Data Analysis
Report

Figure 14: Flow Chart for Pencil & Paper Tests

F. Conclusion

In the description of the evaluation system for the Life Skills Course, several shortcomings can be seen. The very serious matter of transfer outside of the training setting was not addressed (Zone II in Figure 4) although follow up was done on the several intakes (Zone III). Another problem has been the lack of coordination in the joint evaluation of Life Skills and Basic Education Courses. Again these inadequacies were recognized but not addressed.

One of the major results of this formative evaluation system, in addition to assisting course development, is reflected in this paper: that is, developing a general philosophy of evaluation and specific procedures for developing evaluation systems (described in sections III and IV). This was not an objective of course development but was a "spin off" into the areas of "Evaluative Research" (see part I.B.) and contribution to the "Science/Art of Evaluation".

III. SYSTEMS FOR DEVELOPMENT OF PROGRAMS

Saskatchewan NewStart began to develop, evaluate and integrate two interrelated general models: the first involved the 12 stages of developing programs in the area of human resource development (Annex A); and the second included generalized systems for development of various components of projects in these various stages of development. Parts of these two models have been developed to varying degrees of completeness. This section gives a brief summary of the systems which have been developed to serve as background to a more detailed summary of the procedures for developing evaluation systems.

A. Stages of Program Development (See Annex A)

At present, 12 stages are conceived of in program development. These are, in name: (1) Concept study, (2) Exploratory development, (3) Prototype development, (4) Pilot study, (5) Advanced development, (9) Operational Systems development, (10) Demonstration project, (11) Dissemination, (12) Installation. See Annex A for the definitions of these 12 facets of development. Numbers 1 through 7 take place primarily in the Development/Training/Evaluation setting whereas, 8 through 12 deal primarily with events and settings outside.

B. Relations Between Developmental Stages and the Systems of Development

Annex B provides a picture of some of the interrelations between the developmental stages and project development. This diagram illustrates the complexities of the simultaneous development of the Basic Education and Life Skills Courses with their accompanying Coach Training Courses. This picture is an idealized model of the developmental process and should not be viewed as a statement of how the two illustrative courses were in fact developed. In the diagram, the stages of the developmental sequence are listed along the bottom except for dissemination which occurs in an informal and formal manner throughout all the stages of development. Also, as indicated, a preliminary field test stage may be conducted prior to the formalization of the program in order to gather information on the workability of the program in settings different from the one in which it was developed.

In the diagram (Annex B) illustrating the initial simultaneous development of the Life Skills and Basic Education (plus the coach training) Courses, these aspects are diagrammed for each of the projects and the interrelations and inputs are indicated by the one and two way arrows. In this diagram, the place where the various annexes are appropriate is indicated by the circled letters.

The initial step is the Concept Study and conceptualization of the course (see Annex C). After this has been completed to as great an extent as possible, there is a simultaneous development of the course and the Evaluation System (see Annexes D and E) and a little later the preparation for the trial run of the course (see Annex F). It is important to emphasize that the course and the Evaluation System development should occur simultaneously and in close interaction so that when certain content or implementation methodologies are developed, the people developing the evaluation system will have the task of devising methods of evaluating the usefulness and effectiveness of the aspect developed. This interaction between course and evaluation development will produce a more precise statement of instruction and course objectives since the developers may propose an objective, content, or method, which is too vague to be evaluated and thus no information on its place in the course can be gathered.

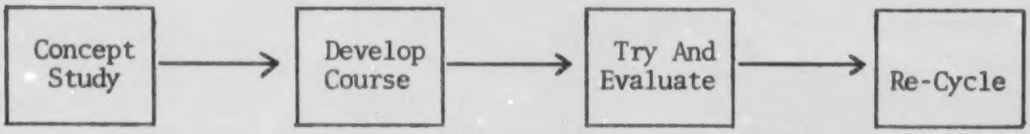
The progress made in the course and evaluation development provide input into the Coach Training Course development. This relationship, while not completely diagrammed is very important. However, there will always be a lag between the Course development and the Coach Training Course development until the Project Formalization stage is reached. Once the Course and Evaluation Systems are developed and their inputs into the preparation for the trial of the course are made, the next step is to try the courses and implement the evaluation system incorporating both formative and summative evaluations (see Annex F). Since evaluation is a continuous process, there is constant redevelopment occurring in both the course and the evaluation system. This again is an undiagrammed process but occurs naturally since both the course and the evaluation system are being tried and evaluated for their redevelopment implications. The cycle of conceptualization, development, trial, and evaluation is in constant flux. Thus, in the total process of project development one simply stops this cycle and formalizes the course or program at an arbitrary stage of development.

IV. PROCEDURES FOR DEVELOPING EVALUATION SYSTEMS

This section of the paper provides a more detailed description of the steps and stages involved in developing an evaluation system and indicates the types of information, sources of information and the decision points. An initial attempt at a behavioural specification of evaluation system development is contained at Annex G. In order to discuss these procedures more meaningfully, the previous section of this paper provided a brief description of the context of the "procedures for developing evaluation systems".

A. Evaluation Model

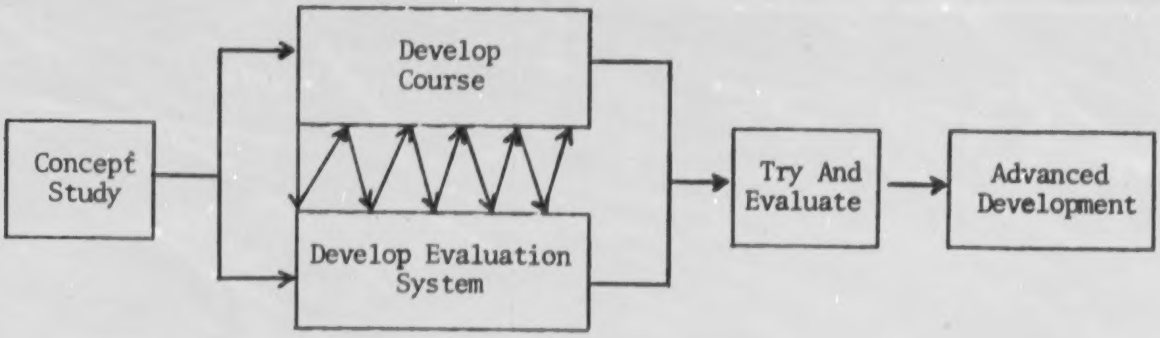
Many writers have articulated course development models similar to the following:



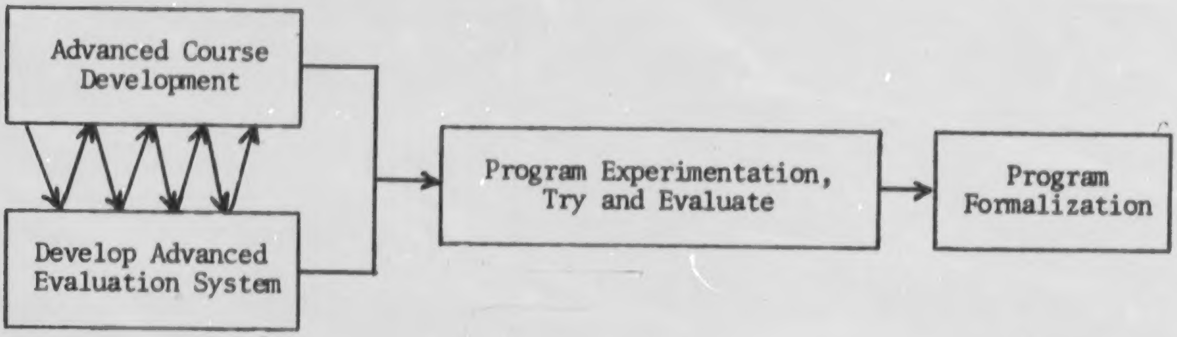
This type of model fails to recognize that development of an evaluation system is difficult and time consuming. Failure to attend to the evaluation development too often means that the questions on how or what to evaluate are being asked half way through the trial of a course. Indeed, all too often evaluators attempt to obtain evaluative information from whatever data may have been accumulated, after a pilot course has been completed.

In addition, this model does not make explicit what is meant by "Re-Cycle". Certainly they cannot mean that all aspects of conceptualization, development and testing must be redone! Presumably, the information obtained will show the effectiveness and efficiency with which the course has been developed and tried and the specific components which require further development.

The approach to evaluation for this paper is shown in the following model:


Develop Course
Concept Study
Develop Evaluation System
Try And Evaluate
Advanced Development

This model recognizes the need to develop, concurrently with course development, an evaluation system which is directed to obtaining the information required to do advanced development. The same approach can be used for more advanced developmental stages, i.e.:


Advanced Course Development
Develop Advanced Evaluation System
Program Experimentation, Try and Evaluate
Program Formalization

B. Evaluation Requirements

1. Overview of Total Requirements

The three primary purposes for developing an evaluation system are:

a. To obtain information for course developers so they can make appropriate decisions to accept, modify or reject developed components and concepts (formative evaluation).

b. To obtain information which is required for dissemination activities (summative evaluation).

c. To obtain information which will aid the users in the installation of developed and tested course packages.

It is probably impossible to articulate all the possible evaluation information requirements which could or should be obtained. The following list is neither exhaustive nor exclusive of all information required:

1. How effective or efficient is the master or prime instructional strategy (e.g., IPI, group process)?

2. How closely does the developed course reflect the concept expressed in the outline design specification?

3. How closely does the developed course fit the parameters and bounds described in the outline design specification?

4. How valid and complete is the course content?

5. How closely do the instructional objectives meet the stated criteria?

6. How realistic are the stated student entry characteristics?

7. Lesson Plans/Curriculum Guide and Associated Methods and Materials:

    (a) How closely do they meet the stated criteria?

    (b) How closely do they result in student achievement of the instructional objectives?

    (c) How effective and efficient is the student/instructor organization (e.g., specialist, coaches, one coach per group)?

    (d) What additional or alternative methods or materials exist for achieving the instructional objectives?

    (e) How effective and efficient is the student/coach ratio?

8. What is the optimal sequence within each course and between associated courses?

9. What effect does group composition have on outcomes?

10. To what extent do the students achieve the instructional and course objectives?

11. To what extent do the students retain and apply the skills, knowledge and attitudes learned?

12. How compatible are the instructional staff behaviours with the course objectives?

13. How appropriate are the standardized tests used for the student population?

14. How well do the administrative and support systems meet the needs of the potential users of the course package?

2. Information Requirements Related to Developmental Stages

The course strategy should be evaluated quickly to ensure that it is effective and efficient before making a large expenditure of time and money. On the other hand determining the optimal course grouping implies experimentation and it would be impractical to attempt to obtain this information from the Pilot Study. Table 3 is an attempt to relate the evaluation information requirements to the developmental stages.

C. Development Procedures

(1) Outline Design Specifications For Evaluation Development

The outline design specification for evaluation development is a guide for direction and emphasis to be placed on evaluation for the particular project. It should contain: (a) All the information contained in the course development design specification; (b) Decision areas to be addressed in the evaluation system OR priorities for component evaluation development; (c) A direction for the allotment of specific staff members, assistance from other divisions, use of consultants, etc.

RELATIONSHP BETWEEN EVALUATION INFORMATION REQUIREMENTS AND DEVELOPMENT STAGES
TABLE 3

EVALUATION REQUIREMENTS	DEVELOPMENTAL STAGES										
	Exploratory Development	Prototype Development	Pilot Study	Advanced Development	Program Experimentation	Program Formalization	Field Test	Operation, Systems Development	Demo Project	Dissemination	Installation
1. Instructional strategy	(x)	a	x	a	x	a			x	b	a
2. Developed course, reflect the concept	(x)	a	x	a	x	a				b	
3. Developed course, fit the parameters			x	a	x	a				b	
4. Course content valid and complete	(x)	a	x	a	x	a			a	b	a
5. Instructional objectives meet criteria		(x)		a (x)		a (x)					
6. Student entry characteristics	(x)	a	x	a	x	a			a	b	a
7. Lesson Plans/Curriculum Guide, etc.											
a. Meet criteria	(x)	a (x)	x	a (x)	x	a					
b. Student achievement			x	a	x	a				b	
c. Student/instructor organization			x	a	x	a			a	b	a
d. Additional or alternative methods			x	a	x	a			a	b	a
e. Student/coach ratio			x	a	x	a			a	b	a
8. a. Sequence within course					x	a	x	b	a	b	a
b. Sequence between associated courses					x	a	x	a	a	b	a
9. Group composition					x	a			a	b	a
10. a. Students achieve instructional objectives			x	b	x	b	x		x	a	
b. Students achieve course objectives			x	b	x	b	x		x	a	
11. Retain and apply skills, knowledge			x	b	x	b	x		x	a	
12. Instructional staff behaviours			x	b	x	a	x		x	b	a
13. Standardized tests			x	b	x	a			x	b	a
14. Administrative and support systems							x	a	x	b	a

CODE: Stage where evaluation information obtrained

(x) - logical analysis, professional judgments, opinion, etc.
x - empirical trials and measurements of effects on students
a - stage where evaluation information of primary use
b - stage where evaluation information of secondary use

The specification for a Pilot Course evaluation system might, for example, direct that special emphasis be placed on student achievement and on the effectiveness of the developed lesson plans. Advanced development at a later date might be directed to obtaining information on the optimal sequencing and group composition, etc.

(2) Design Specification Study and Conference

Experience has shown it to be essential that development work should not commence until there is assurance that a consensus of the concept and specification is held by both management and developers. This includes: (a) A thorough study of the design specification to ensure that all assigned staff members have a good understanding of the requirement. Clarification must be sought if there are doubts about the specification of ideas for constructive improvement; (b) A conference with the management to consider any proposed amendments to the specification, to make initial decisions on the requirements for additional staff or for consultant requirements, and to ensure, through discussion, that the development and management staff have a clear understanding of the evaluation requirements to be addressed.

The above conference may be held in conjunction with the course development design conference. If not, it is important to ensure that decisions reached at each conference are passed to the associated development staff members.

(3) Input From Course Development

As strategies, methods, and materials are developed as a product of the course development activities, the components should be passed to the evaluation development staff. The diagrams as Annexes D and E to this paper should be read in conjunction with this part of the paper. The diagram is not intended to display a process where one step must be completed before the next step may be started. In fact, many steps can be carried out simultaneously and others may be cyclic in nature. The sizes of the diagrams are not related to the time frame nor do they give any indication of the amount of work involved in each step. The diamonds show decision points where the development process can be given critical examination. The diagram is not intended to show a "one way" passage of information from the course developers to evaluation developers. If the developmental staff members are to achieve unity of effort, there must be frequent conferences and consultation between course and evaluation developers, e.g., in developing behavioural objectives.

(4) Input From Instruction

If it is necessary or desirable to develop and conduct a coach training course, the activities should be similar to those described in course development and development of the evaluation system (Annexes D and E) with an evaluation system specifically developed to evaluate the instructional staff course (coach training course in Annex B).

In any event,it is extremely important that the Evaluation System include means of measuring the compatibility of the instructional staff behaviours and attitudes to the course requirements.

(5) Input From Administrative and Support Systems

The corporation (Organizational Context) will probably develop administrative and support systems such as student career and personal counselling and information systems. Some unique support systems may have to be developed for some courses. These may have considerable effects on student achievement and it is therefore important that the impact of these associated or unique systems be evaluated (Figure 3, areas 3, 4 and 6). It is also important to realize that when projects are installed in other agencies, we must be able to identify which of these systems are essential for adoption and which are only corporation requirements.

D. Evaluation Component Development

(1) Overview

The diagram at Annex D shows evaluation component development as a single activity. In fact, component development should be treated as a series of discrete and ordered activities which are developed in a systematic manner.

The diagram at Annex E suggests the following series of ordered activities for component development: Determine Decision Areas, Determine Information Requirements, Determine Methodology, and Prepare Detailed Procedures.

(2) Determine Decision Areas

If information is to be obtained for decision making, this step should include the determination of the decisions which are to be made. On the other hand, if decisions have already been made this step should include the recording of these decisions as a basis for subsequent activities.

Who are the decision makers? For certain major decisions this might be the executive head of the organization, who will have exercised the perrogative in this domain by stating the requirements or decisions in the Outline Design Specification. For course redevelopment, the course developers should probably be considered the decision makers. In decisions made or required in the Dissemination and Installation Phases, course development managers might well be the prime decision makers.

The decision makers, not the evaluators, should primarily determine the nature of the domain to be examined. The evaluator can and should, however, point out inconsistencies, potential difficulties, or additional data that might modify the decision maker's views on the relevance of certain concepts.

(3) Determine Information Requirements

The following steps are suggested within this activity:

(a) Determine what information is required. Based upon the decision requirements specified in the previous activity the evaluator will have to decide what information will enable the decision makers to arrive at appropriate decisions and assist in the implementation of these decisions.

(b) Determine when the information is required.

(4) Determine Methodology

This activity subsumes a number of steps:

(a) Ascertain what data must be obtained.

(b) Determine the potential source of the required data.

(c) Design or select the data collection instruments.

(d) Ascertain when the data should be obtained.

(e) Determine how the data will be processed to obtain the required information.

(f) Develop suitable formats for reporting the information and the circulation of the reports.

(5) Prepare Detailed Procedures

To ensure that the required information is obtained it is essential that detailed procedures and responsibilities be articulated. These procedures should make explicit the timings and responsibilities for data collection, the processing required, and the dates or timings for submission of data collection instruments and evaluation information.

(6) Obtain Approval of Component Development

As evaluation components are developed they should be examined by the course development staff. When staff consensus has been reached, they should be integrated into the total project evaluation system.

E. System Development

(1) Overview

It was stated that, "component development should be treated as a series of discrete and ordered activities which are developed in a systematic manner". However, as the evaluation components are developed, they must be accumulated and integrated.

The integrated evaluation system must include all evaluation components which were developed using inputs from course development, from coach course development, from administration and support system, and from other inputs (see Figure 3).

(2) Evaluation System Package

At this point in time, no attempt has been made to prescribe a standard form or format for the evaluation system packages. It should, however, contain an overview or rationale which describes the developed evaluation systems, a detailed set of procedures, timings, and responsibilities for data gathering and processing, a copy or reference to the instruments which are to be used and details of the reports (including timings, responsibilities, format and circulation) which will be issued to inform staff members of progress.

(3) Approval of Evaluation System Package

The evaluation system package should be examined by the course development staff and by the manager. When development/evaluation consensus has been achieved, the package should be forwarded to the executive head for further discussion and/or approval.

F. Conclusion

The stages of project development and the related systems are in various levels of development. Some systems ("Concept Study", "Course Development" and "Course Trial") have been developed in considerable detail but most are in a fairly primitive and untested state, especially the later stages of the program development. Thus, several systems have yet to be developed which would operationalize the various stages of project development hypothesized.

Finally, the procedure for the development of evaluation systems attempts to make explicit the task areas. However, the explicit relation to course/program development and operation are still quite vague and unintegrated. Development of an evaluation system to encompass the total scope of evaluation indicated in this paper has just been conceived of - not by any stretch of the imagination conceptualized. Steele's (1973) analysis of the complexity of evaluation, and her attempt to provide an initial taxonomy of evaluation systems may point to the impossibility of developing an all-encompassing ultimate evaluation system. At any rate, the science/art of program evaluation is at a more sophisticated level than when we made our first attempts between 1969-1971, described in Part II.

V. SPECIAL EVALUATION CONSIDERATIONS IN THE DEVELOPMENT AND CONTINUED OPERATION OF OPEN, BROADCAST, MULTI-MEDIATED, INDIVIDUALIZED, CONTINUOUS PROGRESS, RESPONSIVE INSTRUCTIONAL SYSTEMS FOR EDUCATING DISADVANTAGED AND/OR ISOLATED ADULTS IN BASIC EDUCATION AND LIFE SKILLS

A. Introduction

This title is long and involved because I wish to impress on the reader that the problem is likewise. In the title "the medium is (part of) the message" since its appearance (format) relays the message in a visual manner independent of the meaning of the words. The structure of this section of the paper will be to "unpack" the title and indicate the evaluation problems produced by each facet of the title. At this time only the areas of problems and the sources for information can be indicated. Total description of the specifications for an evaluation system would require a lengthy treatment.

There are several systems in existence which address certain aspects of the title. The major ones examined as background for this section are the State University of Nebraska (SUN) (see Cavert, 1972a, 1972b; "Procedures for Instructional Design",1972; State University of Nebraska, 1973). Rural Family Development (RFD) (see "The RFD Project", 1972; Smith and Ingroville, 1972; Udvari, 1972); The Open University (OU) of the United Kingdom (see Bates, 1972a, 1972b, 1973a, 1973b; Dirr, 1971; Lewis, 1971a, 1971b, 1971c, 1972; McIntosh, 1972a, 1972b; McIntosh and Bates, 1972; Neil, 1970; Romiszanski, 1973) and the Children's Television Workshop (CTW: "Sesame Street" and "The Electric Company) (see Ball, 1970; Herriott and Liebert, 1972; Palmer, 1972; Reeves, 1970). Each of these projects can contribute to aspects of the total program.

SUN has special strengths in integrating media aspects into instruction and when combined with the Saskatchewan NewStart course development procedures, strong well designed units and modules of instruction could be produced.

RFD sought to deliver combined and integrated individualized Life Skills/Basic Education instruction to disadvantaged and isolated people with the responsive elements of an "Action line" telephone and home visitors.

OU has developed the most elaborate systems and data processing techniques to handle large numbers of widely dispursed students. It also incorporates responsive elements of regional resource centers with tutors and a set of summer sessions. In addition, OU is specifically designed to be a self-correcting continuous development system using feedback from the population. Finally, they have considerable practical experience in the organizational-interaction problems involved in developing multi-mediated course materials (problems in cooperation of content specialists among themselves and with media specialists).

CTW has developed the most sophisticated methods of developing and evaluating the impact of media on the target population (disadvantaged children).

B. Development

The term "development" refers to the process described in the 12 stages of development of new training methods (see Annexes A and B). In addition, other developmental processes are indicated in diagramatic form in Annexes H and I (the SUN development scheme), Annex J (a system for developing the media part of an instructional unit, from Brodt, 1973), and Annex K (the system for the Open University, described in Lewis, 1971a, 1971b, and 1971c).

Inasmuch as detailed instructions on program development already exist there is no need at this time to repeat or summarize this material. However, there are a few general guidelines which should be stated here in regard to development/evaluation of media. (Other development/evaluation considerations are discussed in the sections dealing with Multi-media and Broadcasting.) Since Audio-Visual media are expensive to develop and produce, and since they either should be done with high quality or not at all, a great deal of thought should go into the planning of their use before committing much time and expense to actual production. This evaluative planning basically involves a clear statement of objectives and a clear analysis of the role the various media can play in their attainment (see Step 9 of the SUN course design model, Annex H). Closely related to this is the empirical evaluation of the impact or effectiveness of short and simple media presentations (Reeves, 1970). That is, do not design a complete mediated course, for instance, and then try it out on the representatives of the target population. The consequences of failure or inadequacy are too costly. This constraint, of course, does not apply to material already available. A suggested strategy, in fact, would be to try various available mediated instructional materials on a carefully selected and representative sample of the target population to assess their appropriateness as a medium for this population. If a sufficient variety of media are tried (i.e., sample the materials available) on a sufficient variety of the population the results can be fed into an "information bank" on the appropriateness of different media for different objectives with different people (see Annex H, steps 12, 15 and 17 where information on the effectiveness of media goes into "data bank" for general development guidelines). Other information sources are available in the professional AV lore and literature but it probably does not directly relate to the population of interest (e.g., adults who are disadvantaged, poor, isolated, unsophisticated in media experience, low in education level, etc.). The results of R.F.D. field testing on disadvantaged adults of

Pilot Programs are given on pp. 120-150 (The RFD Project). The results of C.T.W. testing are in Reeves, 1970. The attitudinal results of the field testing done by SUN are reported in State Univ. of Nebraska, 1973, pp. 248-251. Also on pp. 176-184 there are over 133 guidelines listed for the use of TV, audio and non-broadcast media. On pages 159-171 there is a detailed discussion on the relation of module components to levels of objectives. In the OU literature, Bates lists his judgements on the instructional functions of TV (Bates and Moss, 1973, Appendix 1). Also, Gerlach and Ely, 1971 discuss the various media and their relations to teaching and instructional objectives (see especially pp. 282 ff) and Topper (1973) provides a procedure for evaluating the appropriateness of already developed materials.

All this information needs to be gathered and stored for use in developing future mediated units. Then, after a carefully thought out rationale is done, a small and inexpensive (relatively speaking) AV Module is developed and tested. The results put into the "information bank" and related to other relevant information.

SUN suggests assessing mediated modules for the following attributes: audience appeal, comprehensibility, learning, memorability and suggestions for improvement (State University of Nebraska, 1973, pp. 228-232).

In summary, the major point with regard to this development is the serious use of systematically accumulated knowledge and the impact of media on the target population. Available material should be selected to find out if, in fact, it is appropriate or effective for the target population and then develop short media modules for use in an audience reaction study. If the study is successful then a more extensive field study can be undertaken on this same module using circumstances which approach actual conditions in the fully developed course (learning environment in the field).

In outline the sequence involves obtaining audience reactions for: mediated instructional modules of 1 to 15 minutes in length, mediated lessons which are self-contained of 30 to 60 minutes in length and mediated course of 30 or so hours.

SUN field testing procedures and results are discussed in their report, especially on pages 53-58 and 228-239 and need not be repeated here.

C. Continued Operation

The major source for this section is the Open University material since the OU was explicitly designed to be self-corrective and self-improving. To this end, elaborate feedback and data processing systems have been developed. The requirements of the feedback system are sketched in Bates, 1972a, pp. 8-9, the forms used to gather the data from students and field tutors are provided in the appendices. The feedback system using the tutors at the regional resource centers is discussed on pages 3-4. A more complete feedback system using group discussions, "Course Unit Report Forms", telephone interviews and students' letters is described in Bates, 1973a, pp. 8-10, and 15-17. The problems of the logistics of producing and distributing the materials is discussed in Dirr, 1971, p. 17 and Bates, 1973a, pp. 6-8.

The feedback system must provide information on both the course/program materials and the actual operation of the organization in development, production and delivery of programs. This involves the inter-phase of area 4 with areas 5 and 1 as they affect students (Figure 3).

D. Open

"Openness" implies that the clients will be varied and numerous, especially if the program is a successful one. For instance, the "Open University" of the United Kingdom has approximately 50,000 students enrolled. These students are located in all areas of the country, which in England involves considerably less distance than is possible in Canada.

The types of people to whom this program will be of interest include people desiring part- or full-time study programs, workers who need additional training for advancement, families who wish to study together, housewives wishing training to re-enter the labor force, and people who have been away from a formal educational environment for some time and are hesitant to rejoin the standard educational system. The target population will also include people receiving income support from diverse agencies such as; Manpower and Immigration, Unemployment Insurance Commission, Welfare, Indian Affairs, provincial support programs, etc.

Considering the diversity of populations involved and the difficulties in receiving broadcasts in certain locations, no one system is adequate to deliver the necessary information to the student.

Bates (1973b, pp. 4-5) has described the procedure of defining the necessary and critical versus optional characteristics of the target population to which the program of the Open University is directed; SUN has described their efforts at defining the target population on pp. 144-157 in their report, and RFD procedures and results are contained on pp. 144-170 and 255-264 of their report. The recruitment and promotional procedures of RFD are described on pages 41-54. Since the RFD target population is similar to the one in this section, their information is most appropriate to use.

The use of broadcast media is a major mechanism for making the system open (accessible), although open refers mainly to the openness of the "entry bridging systems" (area 3 in Figure 3). Using broadcast media means that the program potentially has wide exposure in the "social/cultural context" (see Figure 1 and area 1 in Figure 3). This in turn creates problems in defining the population to use when evaluating the impact of the program. The "target population" defined in the project description and the actual population the project reaches may be quite different. This is one of the problems of the Open University where the intended target population is the large number of people who, while capable of university level education, dropped out for a variety of reasons. Their actual population (registered students) turns out to be people who are not particularly educationally disadvantaged but find the Open University a convenient way to further their education. The program may attempt to reach "disadvantaged" individuals but, as most people who have worked with the "disadvantaged" know, this is a most difficult group to reach. They tend to be socially isolated from the "main stream" society and broader cultural inputs or else be influenced by the less desirable media aspects of the larger society. In addition, much of the purpose in using mass media is to reach individuals physically isolated, or remote from educational opportunities; that is, people who can not take advantage of educational opportunities because of physical distance or immobility. However, in some instances, the isolation may also mean isolated from access to mass media and electronic communication systems.

E. Broadcast

The problems in the use of broadcast media, alluded to in the prior section, have been much researched and analyzed by the Open University (see Bates, 1972a, 1973a, 1973b; Bates and Moss, 1973; and McIntosh and Bates, 1972). Because of the present and projected difficulties in using the BBC, the Open University is reexamining its use of broadcasting for instructional purposes (Bates 1972a, 1973b and Bates and Moss, 1973 are particularly germaine). In Canada, there are few if any channels available to use for educational purposes at this time. Should they become available, then the use of broadcast media (especially TV) will be more feasible.

While the broadcast media reach many people and are thus good for promotional, enrichment, and special events activities, it is another matter to use them as an integral or required part of the instruction (Bates, 1973a). A comparative study of various media delivery options is contained in Bates, 1973b. The RFD use is described in their report on pp. 55-67 and the Report of External Evaluation Team (beginning after p. 282) provides a short evaluative statement on broadcast usage on pages 17-19.

The two major problems involve the availability of broadcast time, both number of hours and time of day, and how these times fit with student's available time. For instance, if many students work during the day then the mid day hours are of limited use. These two constraints (available network time and student access times) presently limit the usability of broadcasting as a required and integral part of instruction (Bates, 1973b, pp. 18-25). There is an additional problem of whether the population of interest (disadvantaged and/or isolated) has sufficient access to the mass media to warrant use of broadcast delivery. The Quebec system, "Multi-Media", has decided to use alternate methods of delivery of instruction due to these types of problems.

The Open University research did find that the broadcast aspect of their programs produced a pacing function (Bates, 1972a, p. 15) - i.e., helping students to pace their studies to keep up with the assignment and testing dates.

F. Multi Mediated

Most systems using the "open approach" also use a variety of methods of instructional delivery. The aim is to include optional, multiple and mutually supportive methods of taking a given course. For each medium of instruction, certain instructional tasks are set out. Parallel courses are developed where the instructional tasks can be accomplished by more than one medium; in other words, a system whose component parts can be put together in different ways depending upon the needs of the populations and transmission and reception facilities for broadcasts. Needless to say, this is easier said than done. The intention of the multi media approach is to solve the "problem of match" between the learning styles and preferences of students and the manner in which the learning materials are presented. The assumption of this approach is that if the student is provided with enough alternatives, at least one will be optimum for his particular needs.

The use of a variety of media (print and non-print) creates course development problems. For instance, subject matter specialists tend to be print oriented and unfamiliar, indifferent, or hostile to using other media in delivering content. On the other hand, the media specialists are unfamiliar with content areas although they know the process-delivery-medium characteristics. Thus, using multi media delivery of subjects requires considerable cooperative effort among experts who do not ordinarily interact.

The Open University has had considerable problems producing an integrated multi media program (see Bates 1973a, and Bates and Moss, 1973). The use of multi media in the RFD program is described on pp. 18-40 of their report. One of the major problems, related to an integrated mediated instructional package, is deciding what media serves what objective. SUN has made detailed suggestions as to how each component of their lesson module relates to the objectives of the lesson (State University of Nebraska, 1973, pp. 157-174) and Gerlack and Ely have suggested the instructional uses of various media (pp. 282 ff). As mentioned in the development section ("A") of this part of the paper, this area requires careful analysis and evaluation. There is a danger that the programs will be multi media just because it is "an in thing" to be (i.e., "Good is better than evil because it's nicer" - Mammy Yokum).

An initial inventory of possible media components might be as follows: Visual units: film, film cartridges, film strips, video cassetts, broadcast, cable or closed circuit television, slides, still pictures; Audio units: radio, audio tape, audio cassette tapes; Action units: exercises, experiments, problems, simulations, workbooks, self testing; Print units: commercial newspaper, bulletins, student newspaper, correspondence syllabi, study guides, achievement examinations, books, texts, readings, homework assignments; Responsive units (providing opportunities for interaction): action line (telephone-radio combinations), telephone information, tutoring, testing, surveys and assistance, regional learning centres, tutorials in local centers, opinions and evaluation from students (feedback), study club groups, weekend or other classes, short summer sessions, home visits; Miscellaneous units: computer assistance (data processing, scheduling, grading, instruction), degrees and certification.

G. Individualized and Continuous Progress

The Training Research and Development Station in Prince Albert has individualized the basic education course , Learning Individualized for Canadians (LINC), which would be used as the basic curriculum in this program and the life skills component is presently being individualized as much as is feasible using a peer teaching approach. Most 'open' programs require independent study which is one aspect of individualized and continuous progress programs; however the two are not the same. Thus, the Open University courses while requiring "independent study", are paced by due dates for tests and assignments, broadcasts, the distribution of materials and course starting dates (registration). The RFD program (see pp. 79-94) closely approached total individualization since the individuals selected units of interest in the "Content Centers" curriculum (similar to Life Skills) and from there went into the more academic (basic education) aspects of communications and math when the individual discovered he lacked skills needed to cope with the "content center" material.

One problem discovered in Open University research which will be more problematic in 'disadvantaged' populations, is the students' lack of basic learning and study skills needed for independent study. This increases the importance of the 'responsive' aspects of the system (discussed in the next section). Thus the home study component of these approaches which is one of their major strengths is also a source of problems. More emphasis must be put on developing and evaluating support services and student feedback components of these "instructing at a distance" programs than in 'direct instruction' (face to face) delivery approaches.

Scheduling will also be a problem in light of the broadcast times constraints (discussed in section 'D' above). That is, in what ways can a mass broadcast of material be coordinated and integrated in a program where the individual can enter, progress, "step out", reenter, recycle skip, etc., in his own individual and unique pattern of progress.

H. Responsive

The term "responsive" refers to those aspects of an instructional system which are responsive to student requests and needs (a personalized component). Most approaches have found this aspect essential for the operation of "instruction at a distance" programs. Thus, the Open University has elaborate feedback/data processing components. To increase the responsive and personalized aspects of the program, they established study centers with tutors (discussed in Lewis, 1971b, p. 112; Bates, 1972, p. 9), summer schools (Lewis, 1971b, pp. 112-113; Bates, 1972a, p. 10), and a student newspaper (Bates, 1972, p. 3). The Open University has thus done research into the source and type of student difficulties (see McIntosh, 1972a, pp. 35-37 and 1972b), the work load, and the impact of programs on the students' lives (McIntosh, 1972a, p. 44).

The RFD program contains two elements of responsiveness "Action Line" (The RFD Project, pp. 68-78) and "Home Visits" (The RFD Project, pp. 95-107) and SUN has proposed a WATS Telephone Line (State University of Nebraska, 1973, pp. 170-171).

I. Instructional System

This, of course, involves all aspects of the system but there are special problems identified. For instance, The Open University has identified problems of "instructing at a distance" mentioned above (see Lewis, 1971a, pp. 4-5; McIntosh and Bates, 1972, p. 188). In systems which involve certification, problems of assessing student achievement (tests and home work assessment, grades and certification) and developing comparable weights for these components arise. These are problems in any educational system involved in student assessment but special difficulties arise when designing achievement tests for courses developed by teams, with instruction and assessment by a variety of tutors and test readers-graders (including computer scoring). These are discussed in detail by Lewis (1971a, pp. 6-7; 1971b, p. 113; 1972) and by McIntosh and Bates (Bates, 1972a, pp. 3-4; McIntosh and Bates, 1972, pp. 196-197). Many assessment problems are solved or avoided if the instructional materials (e.g., LINC) have been developed using behavioural objectives where methods of assessing achievement are developed hand in hand with materials to attain the objectives.

J. Education in Basic Education and Life Skills

The best available model for an "open approach" to this type of curriculum was developed by RFD in their "content center", basically a cognitive approach to life skills. Applying the life skills concept as described in *Readings in Life Skills* in an open mediated system is another matter and to do so with the "disadvantaged" compounds development/evaluation problems. This again emphasizes the very important aspect of "responsiveness" mentioned in section 'G'; the use of tutors, home visitors, action line, study groups, peer teaching and so on.

K. Disadvantaged and/or Isolated Adults

The last topic in the title is the actual focus of the program: The Target Population. Saskatchewan NewStart and The Training Research and Development Station have considerable information on the demographic personality and ability aspects of the target population but little information on the use of various media with "disadvantaged" adults. RFD has done relevant work here (*The RFD Project*, pp. 119-156, 171-174) and SUN emphasizes the careful definition of the target population and the selection of individuals from this population to test out materials developed. The CTW procedures provide guidelines for this aspect (Palmer, 1972 and Reeves, 1972) although their population was pre-schoolers.

There are special problems of program delivery in using media with the disadvantaged/isolated since part of their "disadvantageness" involves being cut off from available media. Thus, the problem needs special study to describe the types of delivery components which are most feasible for people in certain settings. For instance, using advanced AV technology will be a waste of time and money if the people are unable to operate it or use it to its full potential. This means that not only must the target population be well defined but the learning situations in which they operate must also be specified and the delivery system characteristics matched to both the characteristics of individuals and situations.

L. Contextual Evaluation

This area of study involves evaluating the effects of a system such as is indicated here on the larger context (see Figure 3, area 1, and Figure 1, "An 'Evaluation Space'", Part I.C.5 especially the descriptions of the social context, the population and clients). The introduction of advanced technology and educational delivery systems into a remote and isolated social setting will probably have major repercussions which need to be studied. It is difficult to predict what they will be but there are anthropological studies on the effects of sudden introduction of advanced technology into a "primitive" society. Also, the project will stimulate and be stimulated by the general movement toward a "Global village" which McLuhan talks about as well as attempts to establish public media networks in Canada. At present, these are rare but there is a growing pressure for their establishment. The wide spread use of systems such as these will have an impact on Federal-Provincial relations in the fields of education and communications which should be evaluated. Thus, introducing such a system can have effects on every level of life from establishing a communication link with an isolated individual or community in the north to changing the federal-provincial spheres of control and influence.

M. Conclusion

As stated in the introduction, only the areas of evaluative study have been indicated along with specific reference to relevant literature. There is considerable literature available on how to develop a mediated module of instruction (see Annex J). The major areas in need of study are these:

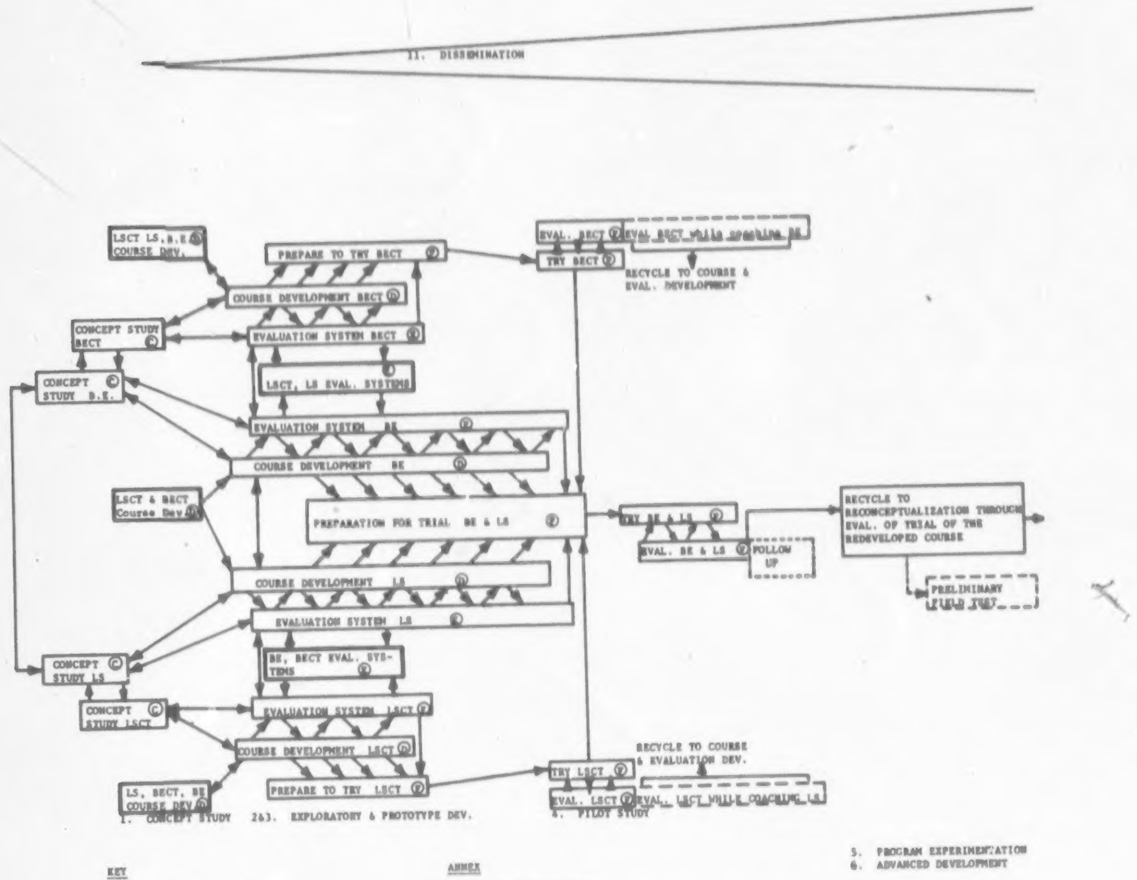
1. How does the target population respond to and learn from the material developed.
2. How can advanced technology be adapted and adopted to technologically primitive situations?
3. What impact does this have on the wider social/cultural context?
4. How can an "instruction at a distance" system be made responsive and effective when the distances covered are very large and the climatic conditions are extreme?
5. What support systems are needed to insure that the programs developed have a reasonable probability of achieving their intended objectives?

In the extreme situations of isolation and disadvantaged, the support aspects of a program will probably have as much impact on the outcomes as the actual courses developed. Thus, in terms of the 12 stages of development (Annex A) those stages of "Field Test", "Operational Systems Development", "Demonstration Project" and "Installation" are in need of more careful study. Most of these questions deal with issues that are in addition to the problems of actually developing a given course of instruction. These problems are difficult enough, particularly when they encompass Life Skills' types of objectives. However, they are compounded when they are placed in the context of an open broadcast, individualized, and continuous progress system with a target population of disadvantaged and/or isolated adults.

ANNEX A

STAGES OF DEVELOPMENT OF NEW TRAINING METHODS	TYPICAL DURATIONS			
	YEAR			
	1	2	3	4
CONCEPT STUDY — review of the problem area to determine the requirements of the situation and to identify goals. Theoretical and research literature are reviewed to assess various theories and methods of intervention which have been attempted. The result is preliminary specification of skills and other factors involved in determining broad strategies to achieve goals.	■□	□	□	
EXPLORATORY DEVELOPMENT — preparation of initial program strategies, methods and materials and the evaluation of their feasibility and limitations. The result will be a more detailed specification and cost analysis and may indicate a reformulation of the concept study.	■			
PROTOTYPE DEVELOPMENT — preparation of detailed program strategies, methods, materials, evaluation systems; training instructional staff, estimating costs and scheduling time and resource requirements.	■	■		
PILOT STUDY — test of the prototype which allows sufficient acquaintanceship with the problem and prototype to permit necessary reformulations and/or specification of logical alternatives.		■		
ADVANCED DEVELOPMENT — redevelopment or further development of the entire program.		■	■□	
PROGRAM EXPERIMENTATION — formally structured, systematic, experimental efforts to test and evaluate alternative program elements with different groups and under various circumstances.			□■	
PROGRAM FORMALIZATION — preparation of a formal model program which can be used elsewhere with predictable results.			□	■
FIELD TEST — of program model under ordinary operating conditions to determine program support services required by the user and the interaction with other programs and services in the user institution or community.			■	
OPERATIONAL SYSTEMS DEVELOPMENT — preparation of the operational systems and procedures for implementers, administrative support personnel and the monitoring agency expected to use the new methods.			□	■
DEMONSTRATION PROJECT — major attempt to foster adoption of the new program including joint sponsorship of the project by a potential user agency in which the operational systems are used.				■
DISSEMINATION — may take place concurrently with previous stages and involves publicity, seminars, conference presentations and publications designed to secure full support for widespread adoption by academic, professional and administrative reference groups.	□	□	□■	■□
INSTALLATION — this final stage includes provision of consulting services and staff training necessary for satisfactory program adoption.				■

■ INTENSIVE DEVELOPMENT □ ONGOING DEVELOPMENT


11. DISSEMINATION
LSCT LS, B.E. Ⓓ COURSE DEV.
PREPARE TO TRY BECT Ⓣ
COURSE DEVELOPMENT BECT Ⓓ
CONCEPT STUDY BECT Ⓒ
EVALUATION SYSTEM BECT Ⓔ
CONCEPT STUDY B.E. Ⓒ
LSCT, LS EVAL. SYSTEMS Ⓔ
EVALUATION SYSTEM BE Ⓔ
COURSE DEVELOPMENT BE Ⓓ
LSCT & BECT Course Dev. Ⓓ
PREPARATION FOR TRIAL BE & LS Ⓣ
COURSE DEVELOPMENT LS Ⓓ
EVALUATION SYSTEM LS Ⓔ
CONCEPT STUDY LS Ⓒ
BE, BECT EVAL. SYSTEMS Ⓔ
CONCEPT STUDY LSCT Ⓒ
EVALUATION SYSTEM LSCT Ⓔ
COURSE DEVELOPMENT LSCT Ⓓ
LS, BECT, BE COURSE DEV Ⓓ
PREPARE TO TRY LSCT Ⓣ
EVAL. BECT Ⓣ
EVAL BECT while coaching BE
TRY BECT Ⓣ
RECYCLE TO COURSE & EVAL. DEVELOPMENT
TRY BE & LS Ⓣ
EVAL. BE & LS Ⓣ
FOLLOW UP
RECYCLE TO RECONCEPTUALIZATION THROUGH EVAL. OF TRIAL OF THE REDEVELOPED COURSE
PRELIMINARY FIELD TEST
RECYCLE TO COURSE & EVALUATION DEV.
TRY LSCT Ⓣ
EVAL. LSCT Ⓣ
EVAL. LSCT WHILE COACHING LS
1. CONCEPT STUDY
2&3. EXPLORATORY & PROTOTYPE DEV.
4. PILOT STUDY
5. PROGRAM EXPERIMENTATION
6. ADVANCED DEVELOPMENT

KEY

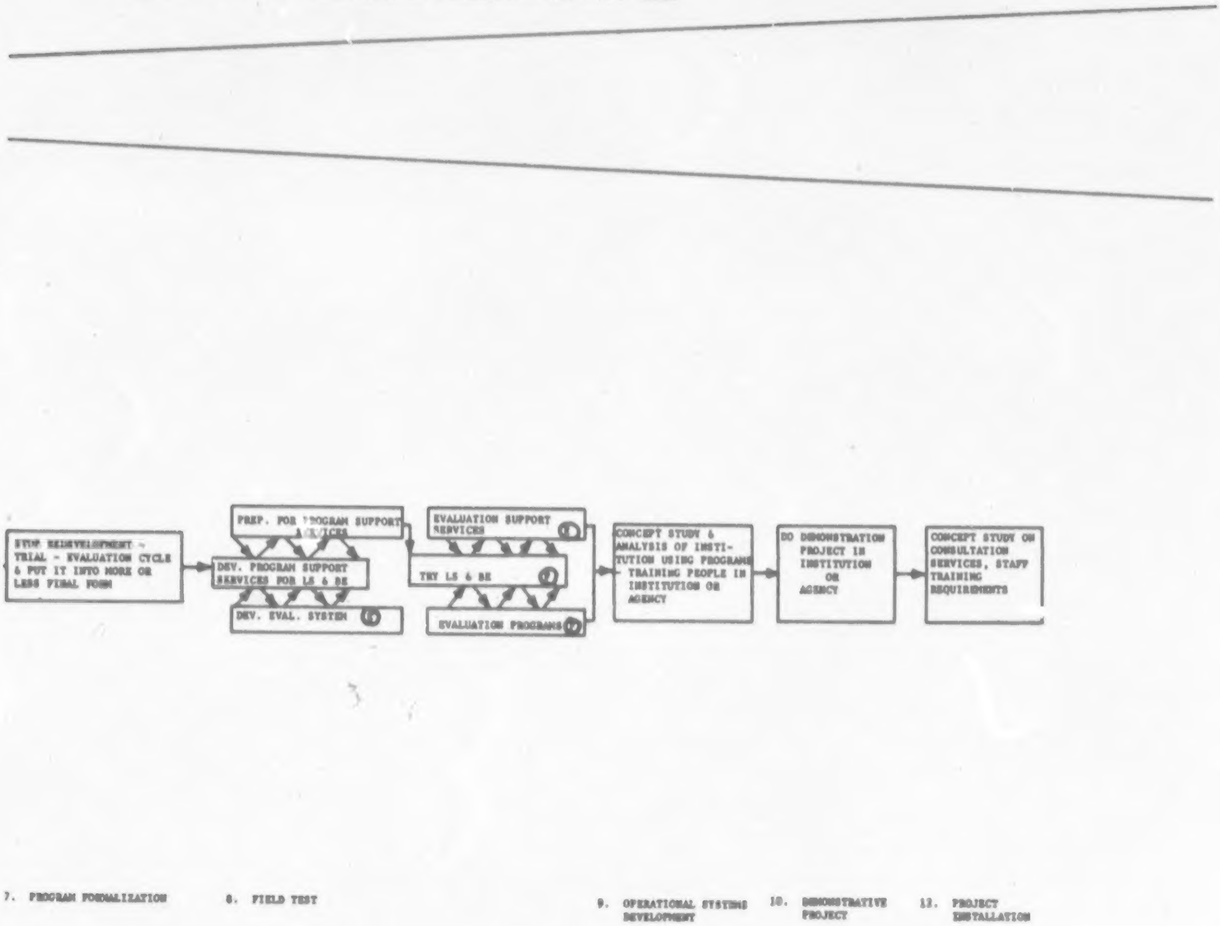
LS	LIFE SKILLS COURSE
BE	BASIC EDUCATION COURSE
LSCT	LIFE SKILLS COACH TRAINING
BECT	BASIC ED. COACH TRAINING

ANNEX

Ⓒ	CONCEPT STUDY SYSTEM
Ⓓ	COURSE DEVELOPMENT SYSTEM
Ⓔ	EVALUATION SYSTEM DEV. SYSTEM
Ⓣ	COURSE TRIAL SYSTEM

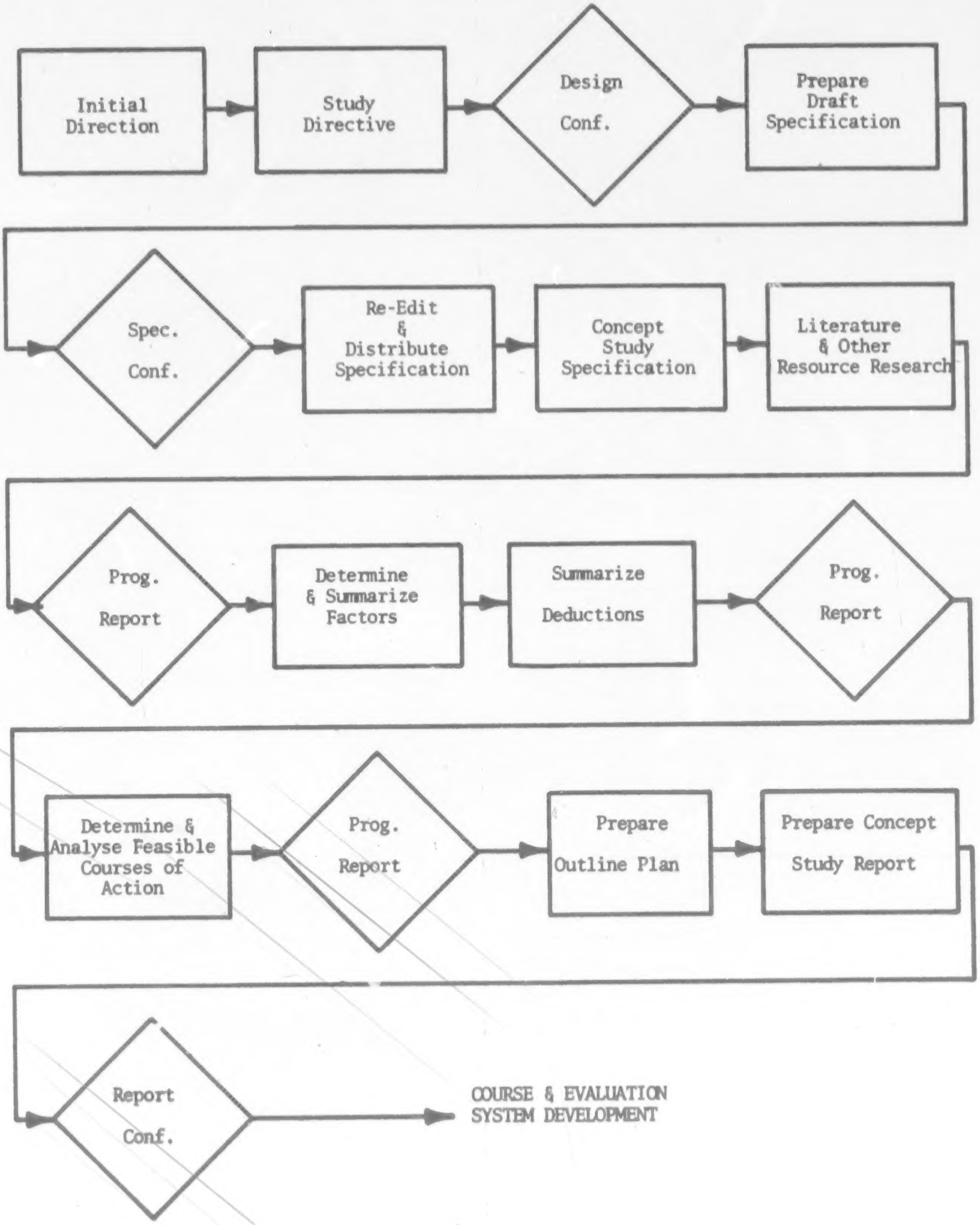
ANNEX B

RELATION BETWEEN STAGES OF PROGRAM DEVELOPMENT & DEVELOPMENT OF COMPONENTS OF COURSE


STOP REDEVELOPMENT - TRIAL - EVALUATION CYCLE & PUT IT INTO MORE OR LESS FINAL FORM
PREP. FOR PROGRAM SUPPORT SERVICES
DEV. PROGRAM SUPPORT SERVICES FOR LS & BE
DEV. EVAL. SYSTEM
EVALUATION SUPPORT SERVICES
TRY LS & BE
EVALUATION PROGRAMS
CONCEPT STUDY & ANALYSIS OF INSTITUTION USING PROGRAMS - TRAINING PEOPLE IN INSTITUTION OR AGENCY
DO DEMONSTRATION PROJECT IN INSTITUTION OR AGENCY
CONCEPT STUDY ON CONSULTATION SERVICES, STAFF TRAINING REQUIREMENTS
7. PROGRAM FORMALIZATION
8. FIELD TEST
9. OPERATIONAL SYSTEMS DEVELOPMENT
10. DEMONSTRATIVE PROJECT
12. PROJECT INSTALLATION

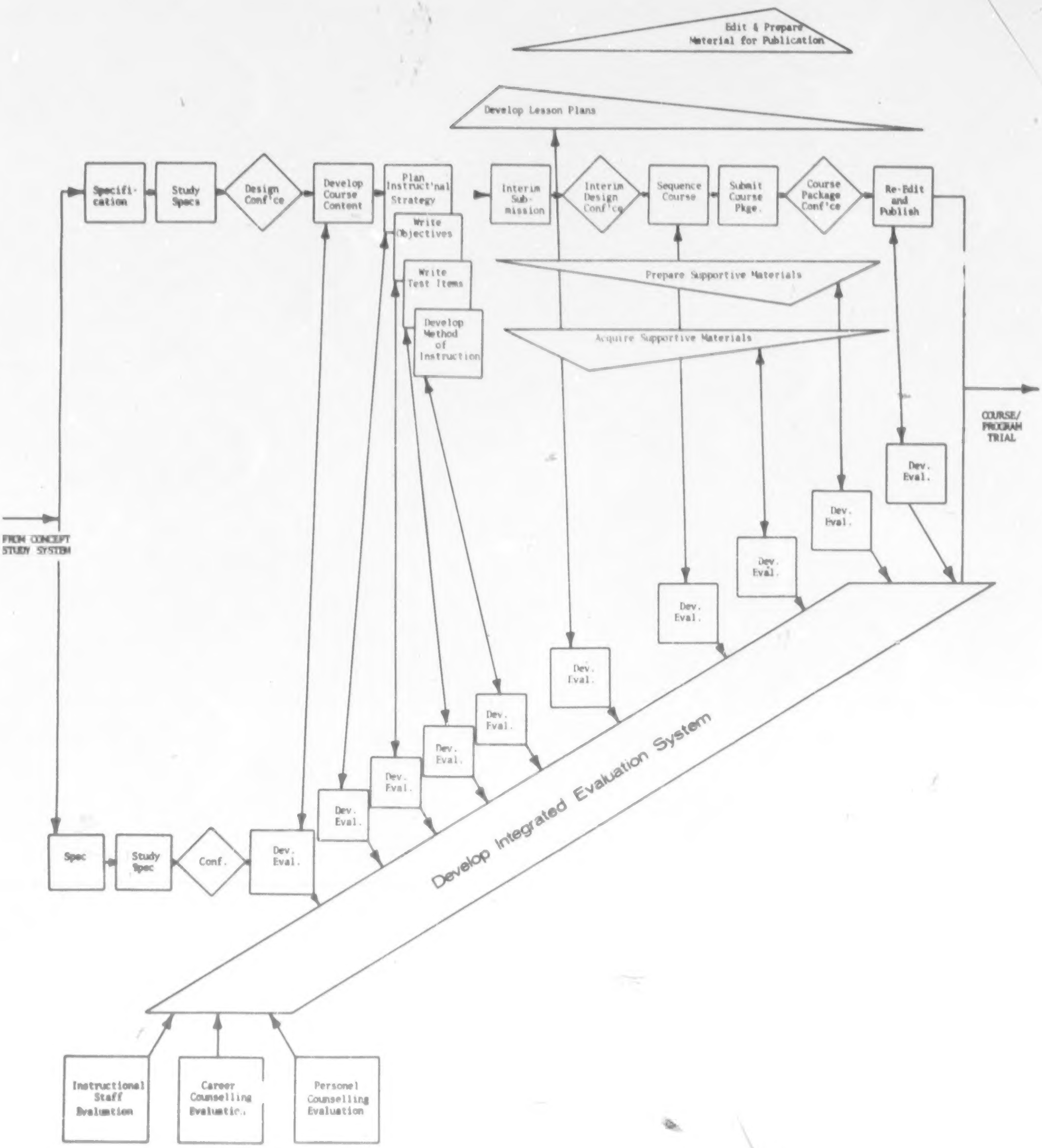
CONCEPT STUDY

ANNEX C


Initial Direction
Study Directive
Design Conf.
Prepare Draft Specification
Spec. Conf.
Re-Edit & Distribute Specification
Concept Study Specification
Literature & Other Resource Research
Prog. Report
Determine & Summarize Factors
Summarize Deductions
Prog. Report
Determine & Analyse Feasible Courses of Action
Prog. Report
Prepare Outline Plan
Prepare Concept Study Report
Report Conf.
COURSE & EVALUATION SYSTEM DEVELOPMENT

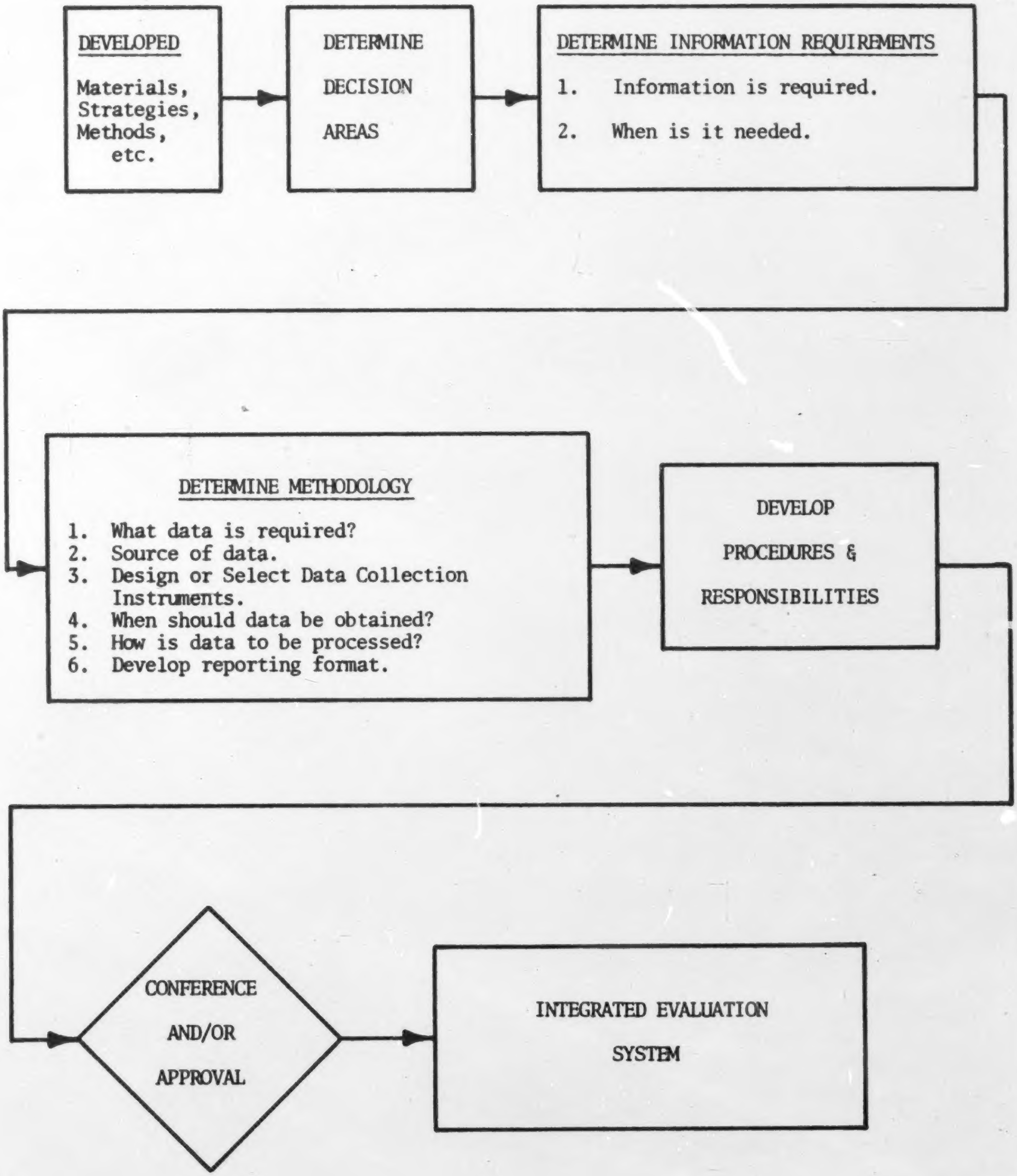
ANNEX D

Course and Evaluation System Development


Edit & Prepare Material for Publication
Develop Lesson Plans
Specification
Study Specs
Design Conf'ce
Develop Course Content
Plan Instruct'nal Strategy
Write Objectives
Write Test Items
Develop Method of Instruction
Interim Sub-mission
Interim Design Conf'ce
Sequence Course
Submit Course Pkge.
Course Package Conf'ce
Re-Edit and Publish
Prepare Supportive Materials
Acquire Supportive Materials
COURSE/PROGRAM TRIAL
FROM CONCEPT STUDY SYSTEM
Dev. Eval.
Dev. Eval.
Dev. Eval.
Dev. Eval.
Dev. Eval.
Dev. Eval.
Dev. Eval.
Dev. Eval.
Dev. Eval.
Dev. Eval.
Dev. Eval.
Spec
Study Spec
Conf.
Dev. Eval.
Develop Integrated Evaluation System
Instructional Staff Evaluation
Career Counselling Evaluatic.
Personel Counselling Evaluation

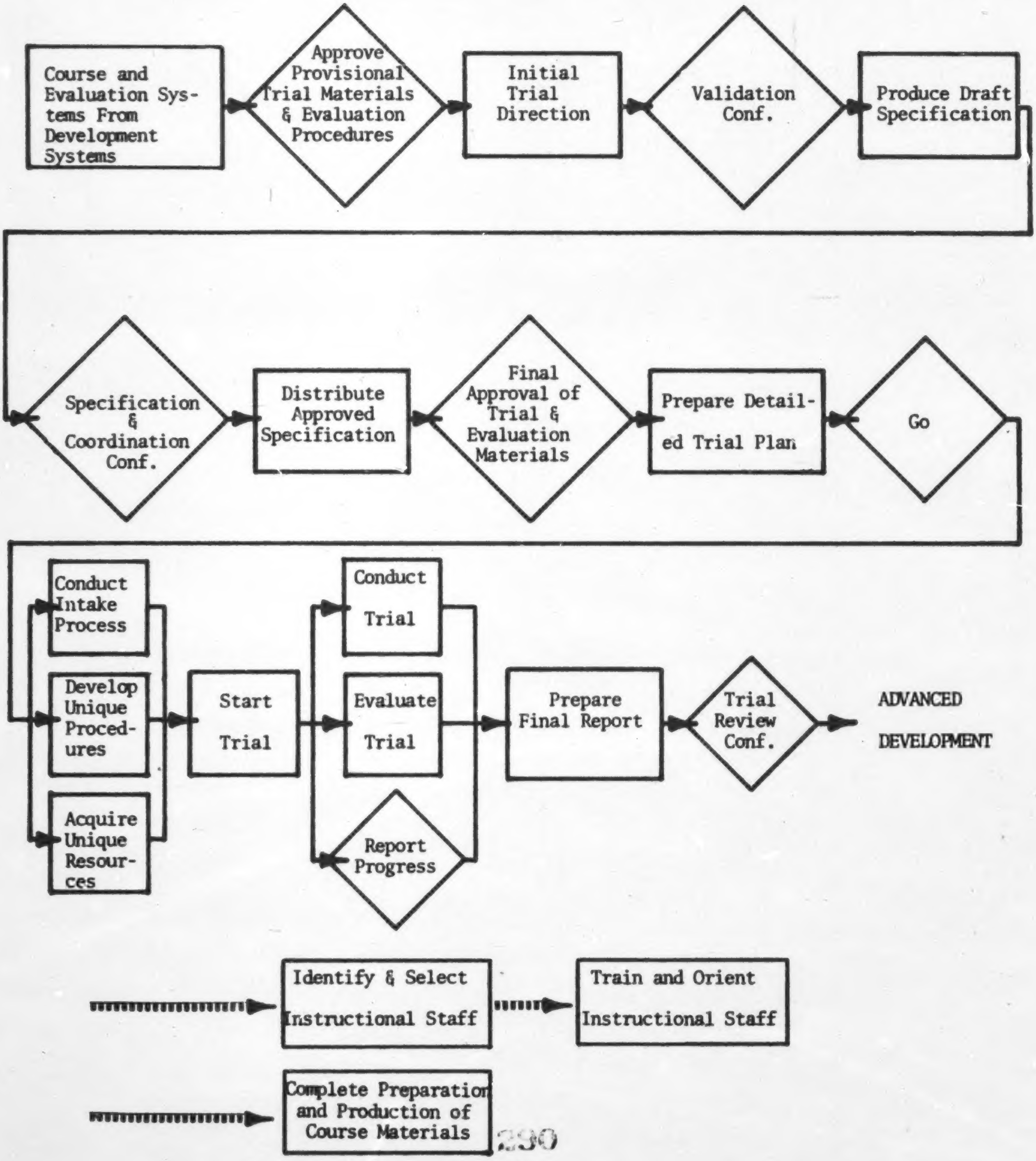
ANNEX E

EVALUATION COMPONENT DEVELOPMENT


DEVELOPED
Materials, Strategies, Methods, etc.
DETERMINE DECISION AREAS
DETERMINE INFORMATION REQUIREMENTS
1. Information is required.
2. When is it needed.
DETERMINE METHODOLOGY
1. What data is required?
2. Source of data.
3. Design or Select Data Collection Instruments.
4. When should data be obtained?
5. How is data to be processed?
6. Develop reporting format.
DEVELOP PROCEDURES & RESPONSIBILITIES
CONFERENCE AND/OR APPROVAL
INTEGRATED EVALUATION SYSTEM

ANNEX F

COURSE/PROGRAM TRIAL


Course and Evaluation Systems From Development Systems
Approve Provisional Trial Materials & Evaluation Procedures
Initial Trial Direction
Validation Conf.
Produce Draft Specification
Specification & Coordination Conf.
Distribute Approved Specification
Final Approval of Trial & Evaluation Materials
Prepare Detailed Trial Plan
Go
Conduct Intake Process
Develop Unique Procedures
Acquire Unique Resources
Start Trial
Conduct Trial
Evaluate Trial
Report Progress
Prepare Final Report
Trial Review Conf.
ADVANCED DEVELOPMENT
Identify & Select Instructional Staff
Train and Orient Instructional Staff
Complete Preparation and Production of Course Materials

ANNEX G

EVALUATION DEVELOPMENT OBJECTIVE

1. Given: (a) an outline design specification for a course to be developed (or redeveloped) or a developed course package, (b) an outline design specification for evaluation development, (c) the developed course components, (d) any standard achievement tests to be used, (e) developed support and administrative systems, and (f) any other information or materials germane to the requirement.

2. Then the evaluation development staff will be able to:

   a. Determine and obtain acceptance for any other decisions which will have to be made.

   b. Determine the decision points and timings where information and alternatives must be provided to:

      i. Managers of the Corporation.

      ii. Manager(s) of the particular project.

      iii. Course Development Staff.

      iv. Evaluation Development Staff.

      v. Instructional Staff.

      vi. Students.

      vii. Staff responsible for support and administrative systems.

   c. Determine the information which will be required to make the decisions.

   d. Determine the data and processing which is required as a basis to arrive at the required information.

   e. Develop or select appropriate data gathering instruments.

   f. Develop the procedures, timings, responsibilities, etc., required to manage the acquisition and processing of the data requirements.

   g. Develop the format(s), circulation and timings to ensure that the required information and alternatives are available for the predetermined decision points.

h. Prepare an integrated evaluation plan which will, in conjunction with the developed course prototype, form the basis for a Project Trial Specification which will enable the instructional staff to obtain, use, and circulate the information and alternatives required for effective decision making.

3. It is assumed that:

   a. The outline design specifications for course development and for evaluation development will contain time or other restraints, points of emphasis and priorities, particular decisions which will be required, and any other criteria required to guide the development activities.

   b. The course development and evaluation staffs will have adequate communication and management to ensure unification of effort.

   c. Staff development will be carried out, as necessary, to ensure competency to achieve the objectives.

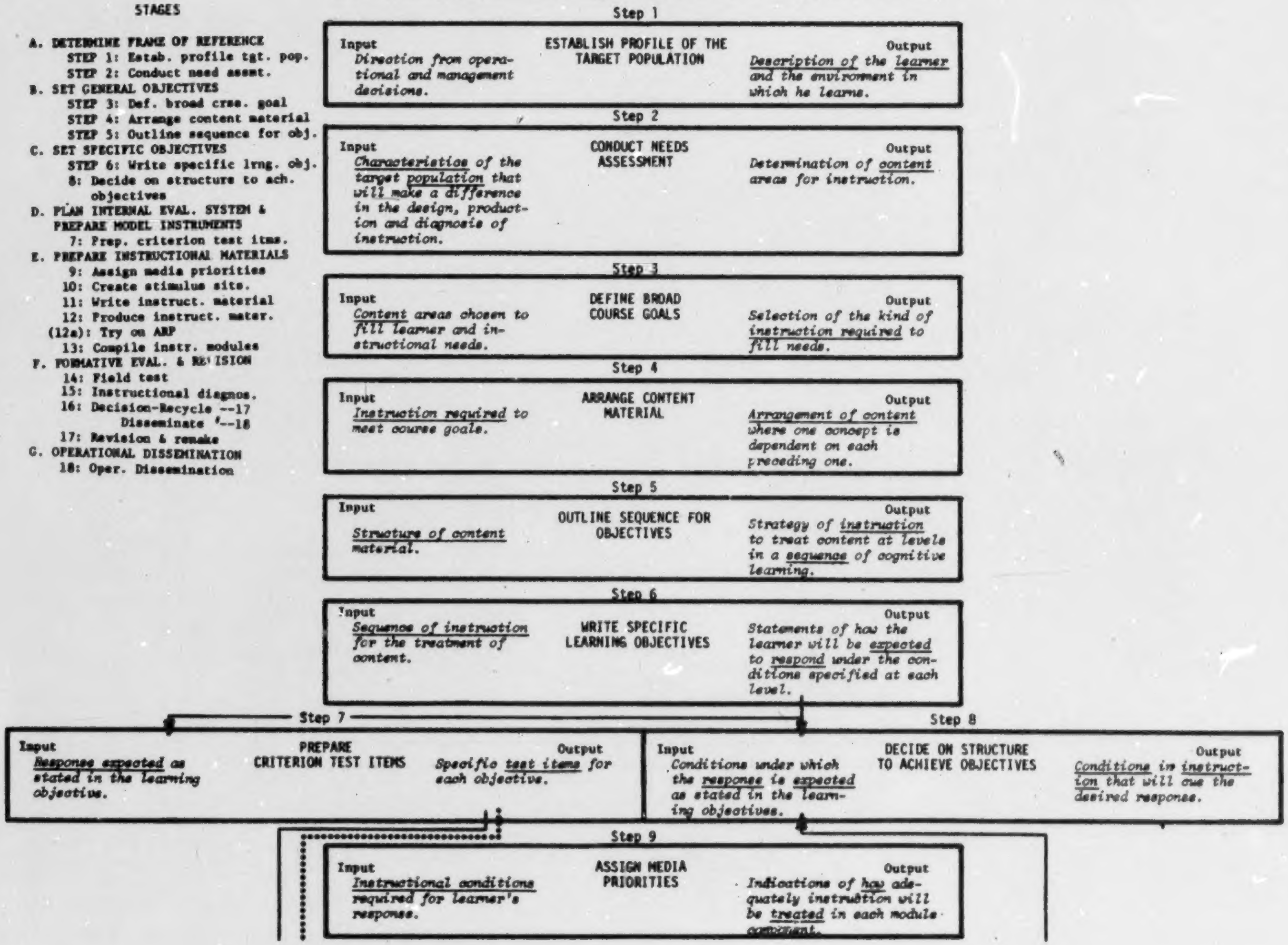
ANNEX H

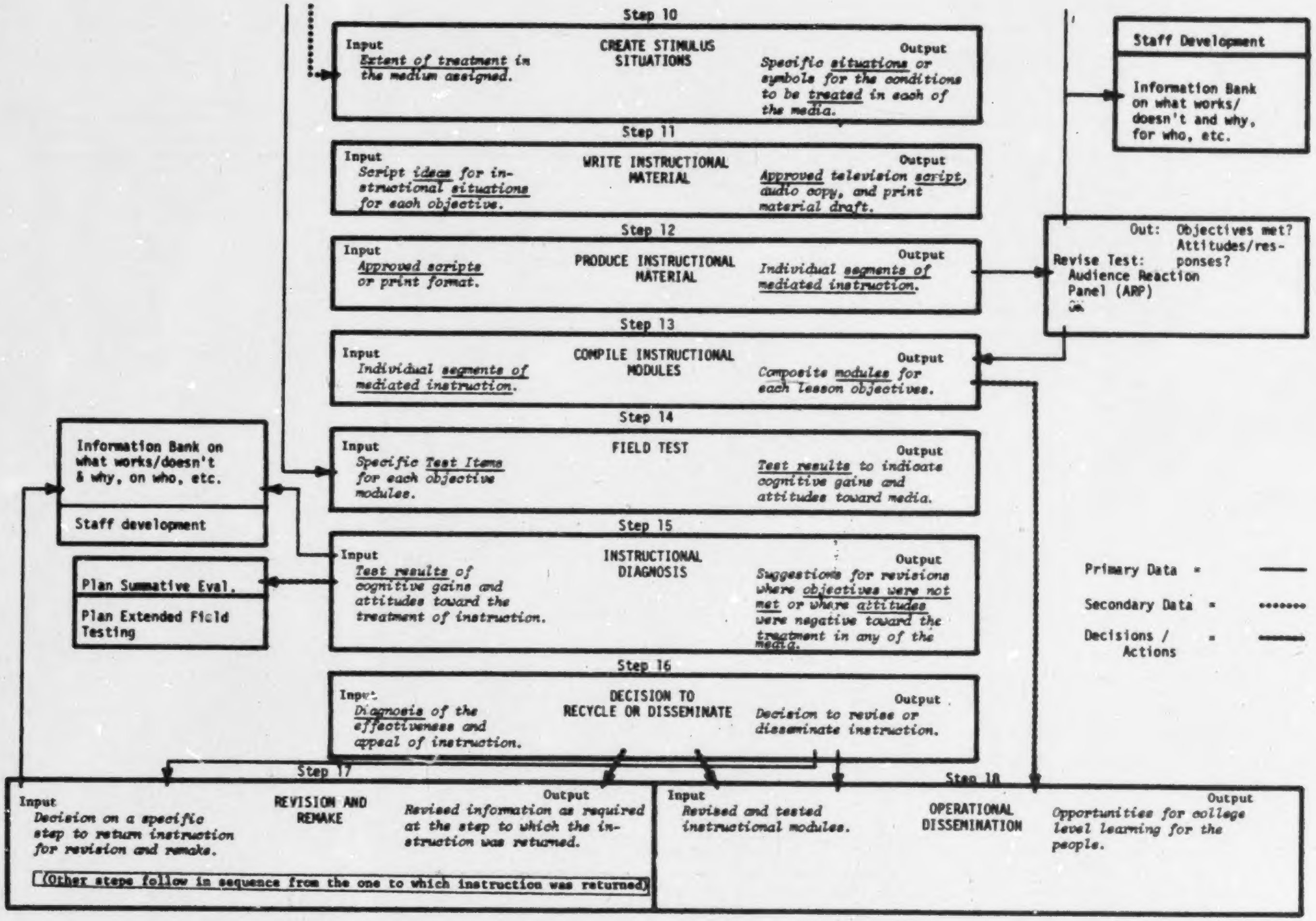
S-U-N

Instructional Design Process * (Modified)

STAGES

A. DETERMINE FRAME OF REFERENCE
    STEP 1: Estab. profile tgt. pop.
    STEP 2: Conduct need assmt.
B. SET GENERAL OBJECTIVES
    STEP 3: Def. broad crse. goal
    STEP 4: Arrange content material
    STEP 5: Outline sequence for obj.
C. SET SPECIFIC OBJECTIVES
    STEP 6: Write specific lrng. obj.
    8: Decide on structure to ach. objectives
D. PLAN INTERNAL EVAL. SYSTEM & PREPARE MODEL INSTRUMENTS
    7: Prep. criterion test itms.
E. PREPARE INSTRUCTIONAL MATERIALS
    9: Assign media priorities
    10: Create stimulus sits.
    11: Write instruct. material
    12: Produce instruct. mater.
    (12a): Try on ARP
    13: Compile instr. modules
F. FORMATIVE EVAL. & REVISION
    14: Field test
    15: Instructional diagnos.
    16: Decision-Recycle --17
        Disseminate '--18
    17: Revision & remake
G. OPERATIONAL DISSEMINATION
    18: Oper. Dissemination

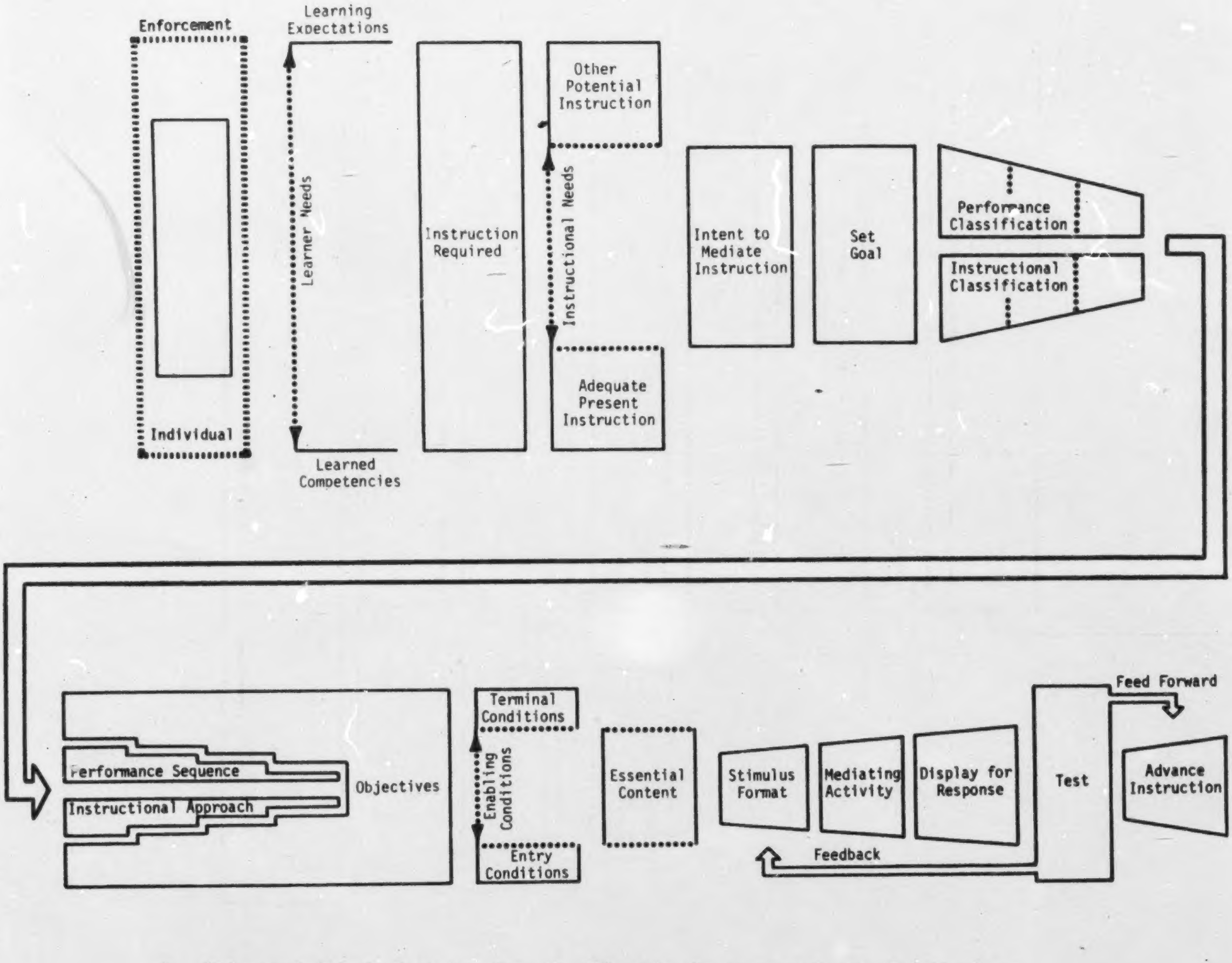

Step 1
Input
Direction from operational and management decisions.
ESTABLISH PROFILE OF THE TARGET POPULATION
Output
Description of the learner and the environment in which he learns.
Step 2
Input
Characteristics of the target population that will make a difference in the design, production and diagnosis of instruction.
CONDUCT NEEDS ASSESSMENT
Output
Determination of content areas for instruction.
Step 3
Input
Content areas chosen to fill learner and instructional needs.
DEFINE BROAD COURSE GOALS
Output
Selection of the kind of instruction required to fill needs.
Step 4
Input
Instruction required to meet course goals.
ARRANGE CONTENT MATERIAL
Output
Arrangement of content where one concept is dependent on each preceding one.
Step 5
Input
Structure of content material.
OUTLINE SEQUENCE FOR OBJECTIVES
Output
Strategy of instruction to treat content at levels in a sequence of cognitive learning.
Step 6
Input
Sequence of instruction for the treatment of content.
WRITE SPECIFIC LEARNING OBJECTIVES
Output
Statements of how the learner will be expected to respond under the conditions specified at each level.
Step 7
Input
Response expected as stated in the learning objective.
PREPARE CRITERION TEST ITEMS
Output
Specific test items for each objective.
Step 8
Input
Conditions under which the response is expected as stated in the learning objectives.
DECIDE ON STRUCTURE TO ACHIEVE OBJECTIVES
Output
Conditions in instruction that will cue the desired response.
Step 9
Input
Instructional conditions required for learner's response.
ASSIGN MEDIA PRIORITIES
Output
Indications of how adequately instruction will be treated in each module component.


Step 10
Input
Extent of treatment in the medium assigned.
CREATE STIMULUS SITUATIONS
Output
Specific situations or symbols for the conditions to be treated in each of the media.
Step 11
Input
Script ideas for instructional situations for each objective.
WRITE INSTRUCTIONAL MATERIAL
Output
Approved television script, audio copy, and print material draft.
Step 12
Input
Approved scripts or print format.
PRODUCE INSTRUCTIONAL MATERIAL
Output
Individual segments of mediated instruction.
Step 13
Input
Individual segments of mediated instruction.
COMPILE INSTRUCTIONAL MODULES
Output
Composite modules for each lesson objectives.
Step 14
Input
Specific Test Items for each objective modules.
FIELD TEST
Output
Test results to indicate cognitive gains and attitudes toward media.
Step 15
Input
Test results of cognitive gains and attitudes toward the treatment of instruction.
INSTRUCTIONAL DIAGNOSIS
Output
Suggestions for revisions where objectives were not met or where attitudes were negative toward the treatment in any of the media.
Step 16
Input
Diagnosis of the effectiveness and appeal of instruction.
DECISION TO RECYCLE OR DISSEMINATE
Output
Decision to revise or disseminate instruction.
Step 17
Input
Decision on a specific step to return instruction for revision and remake.
REVISION AND REMAKE
Output
Revised information as required at the step to which the instruction was returned.
(Other steps follow in sequence from the one to which instruction was returned)
Step 18
Input
Revised and tested instructional modules.
OPERATIONAL DISSEMINATION
Output
Opportunities for college level learning for the people.
Staff Development
Information Bank on what works/doesn't and why, for who, etc.
Out: Objectives met? Attitudes/responses?
Revise Test: Audience Reaction Panel (ARP)
Information Bank on what works/doesn't & why, on who, etc.
Staff development
Plan Summative Eval.
Plan Extended Field Testing
Primary Data =
Secondary Data =
Decisions / Actions =

* (Adapted from) Cavert, Dr. C. Edward, An Approach to the Design of Mediated Instruction, Washington, D.C., AECT Publications, 1974.

ANNEX H

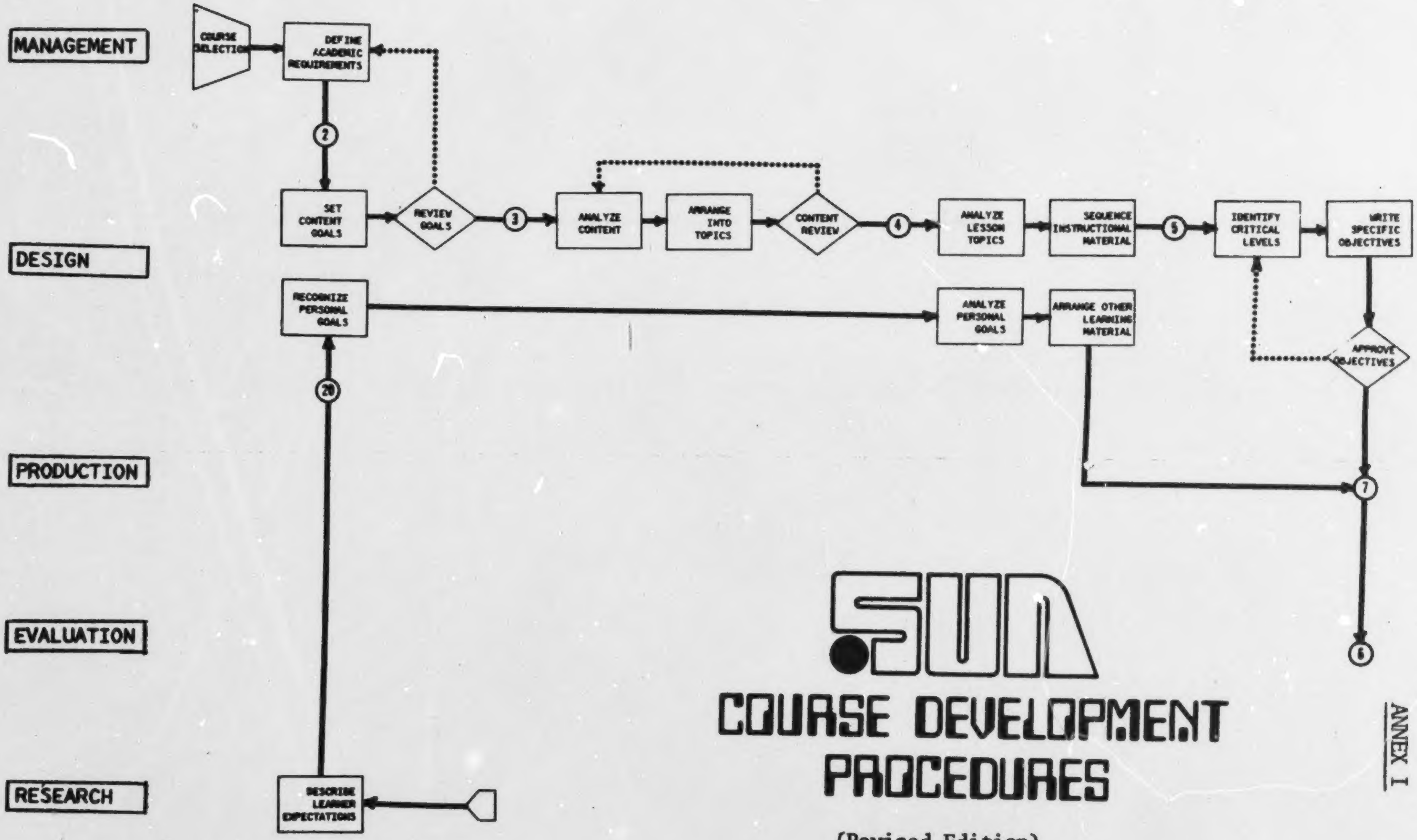
PROCEDURES FOR INSTRUCTIONAL DESIGN * (SUN)


Enforcement
Individual
Learning Expectations
Learner Needs
Learned Competencies
Instruction Required
Other Potential Instruction
Instructional Needs
Adequate Present Instruction
Intent to Mediate Instruction
Set Goal
Performance Classification
Instructional Classification
Performance Sequence
Instructional Approach
Objectives
Terminal Conditions
Enabling Conditions
Entry Conditions
Essential Content
Stimulus Format
Mediating Activity
Display for Response
Test
Feed Forward
Advance Instruction
Feedback

---

* (Adapted from) Cavert, Dr. C. Edward, An Approach to the Design of Mediated Instruction, Washington, D.C., AECT Publications, 1974.

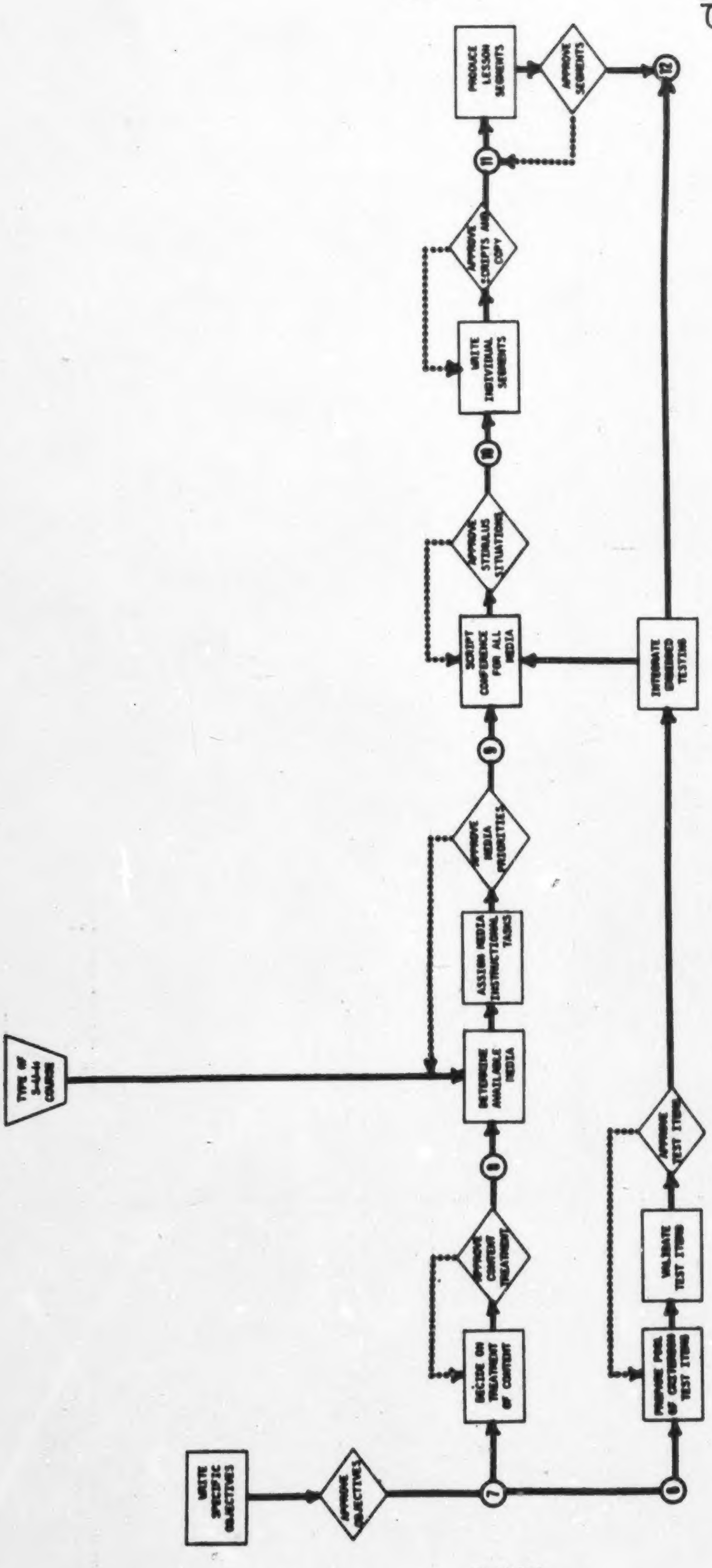
ANNEX I

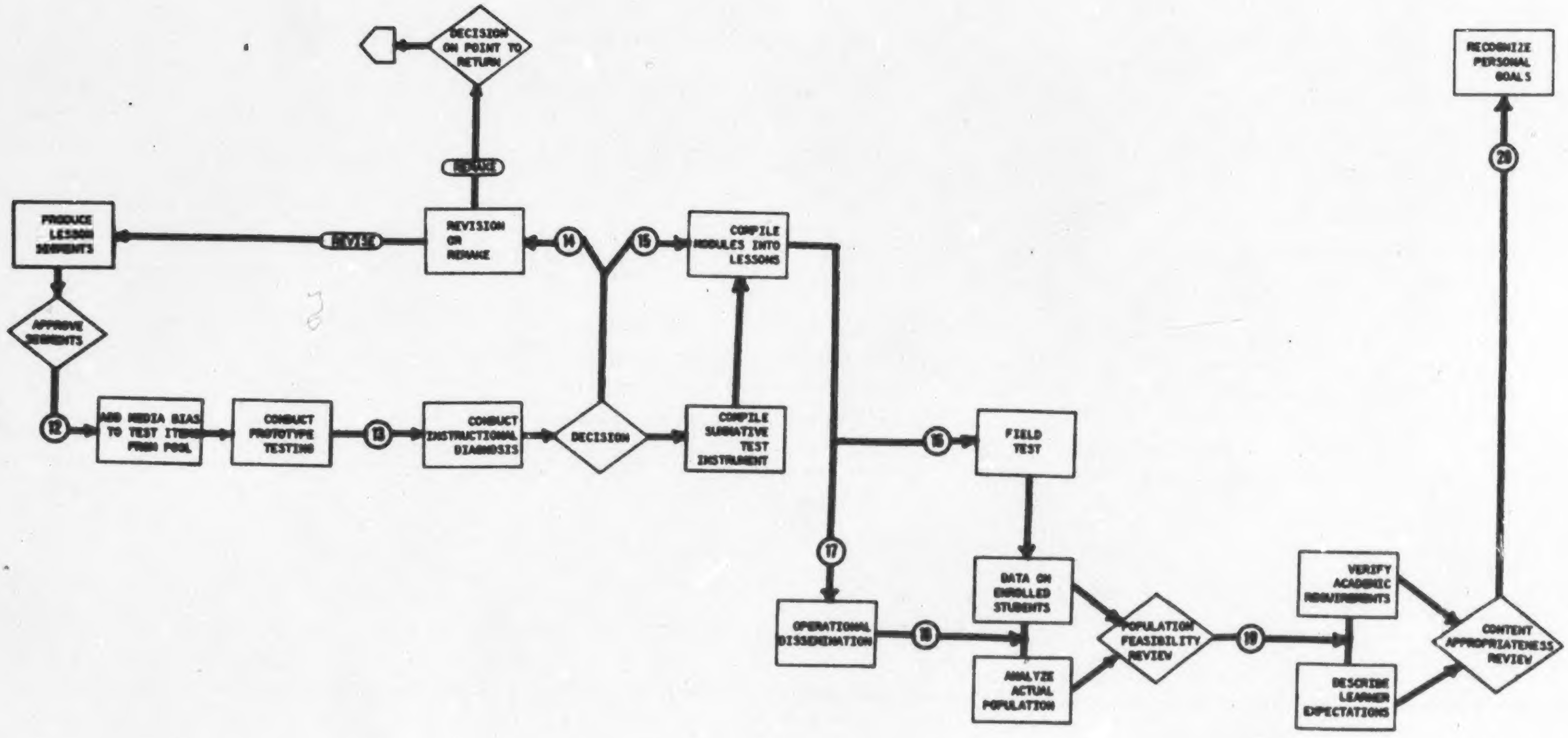

MANAGEMENT
DESIGN
PRODUCTION
EVALUATION
RESEARCH
COURSE SELECTION
DEFINE ACADEMIC REQUIREMENTS
2
SET CONTENT GOALS
REVIEW GOALS
3
ANALYZE CONTENT
ARRANGE INTO TOPICS
CONTENT REVIEW
4
ANALYZE LESSON TOPICS
SEQUENCE INSTRUCTIONAL MATERIAL
5
IDENTIFY CRITICAL LEVELS
WRITE SPECIFIC OBJECTIVES
APPROVE OBJECTIVES
7
6
RECOGNIZE PERSONAL GOALS
ANALYZE PERSONAL GOALS
ARRANGE OTHER LEARNING MATERIAL
20
DESCRIBE LEARNER EXPECTATIONS

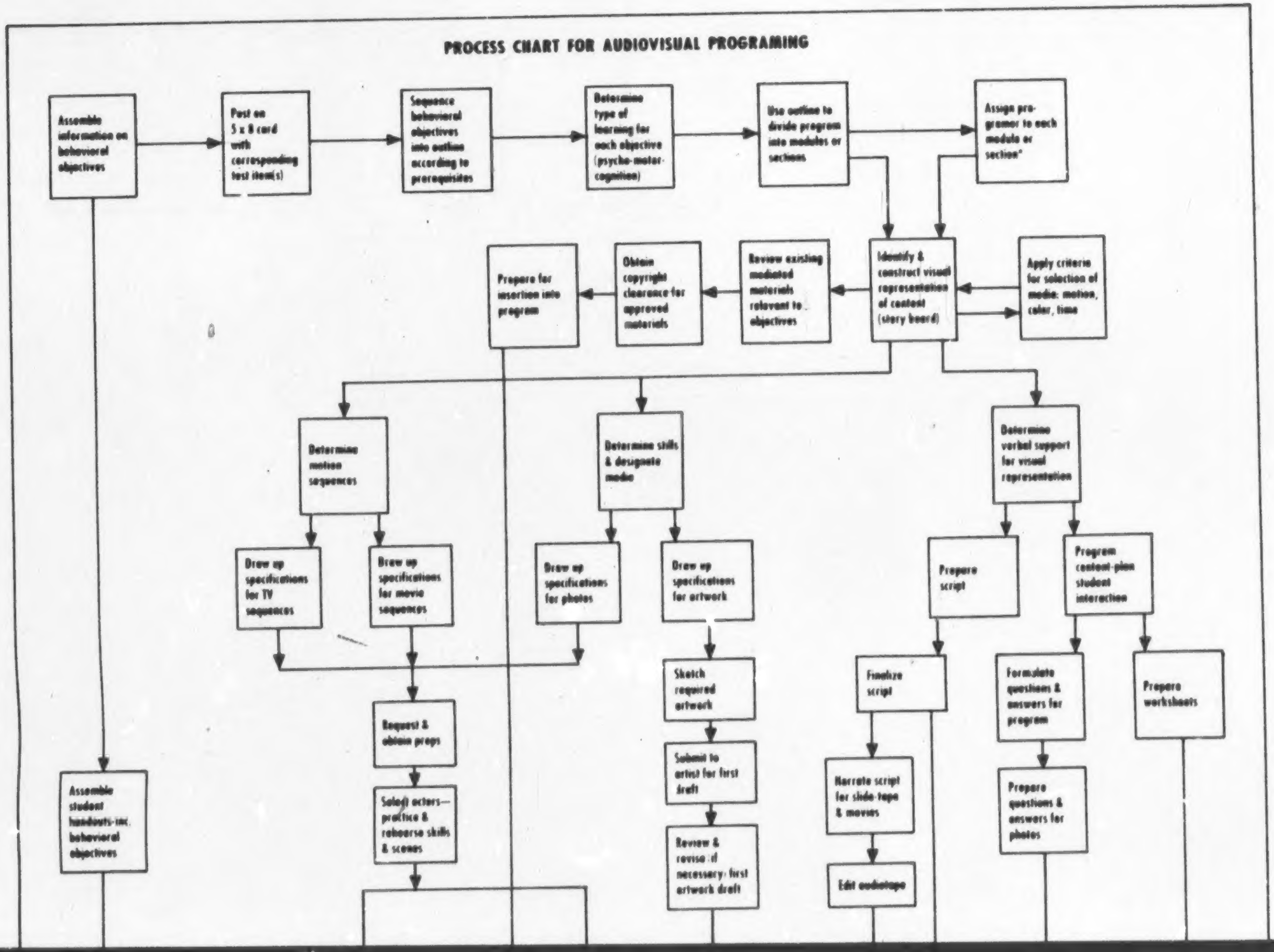
SUN COURSE DEVELOPMENT PROCEDURES

(Revised Edition)

Printed with the permission of Dr. C. Edward Cavert,
State University of Nebraska.

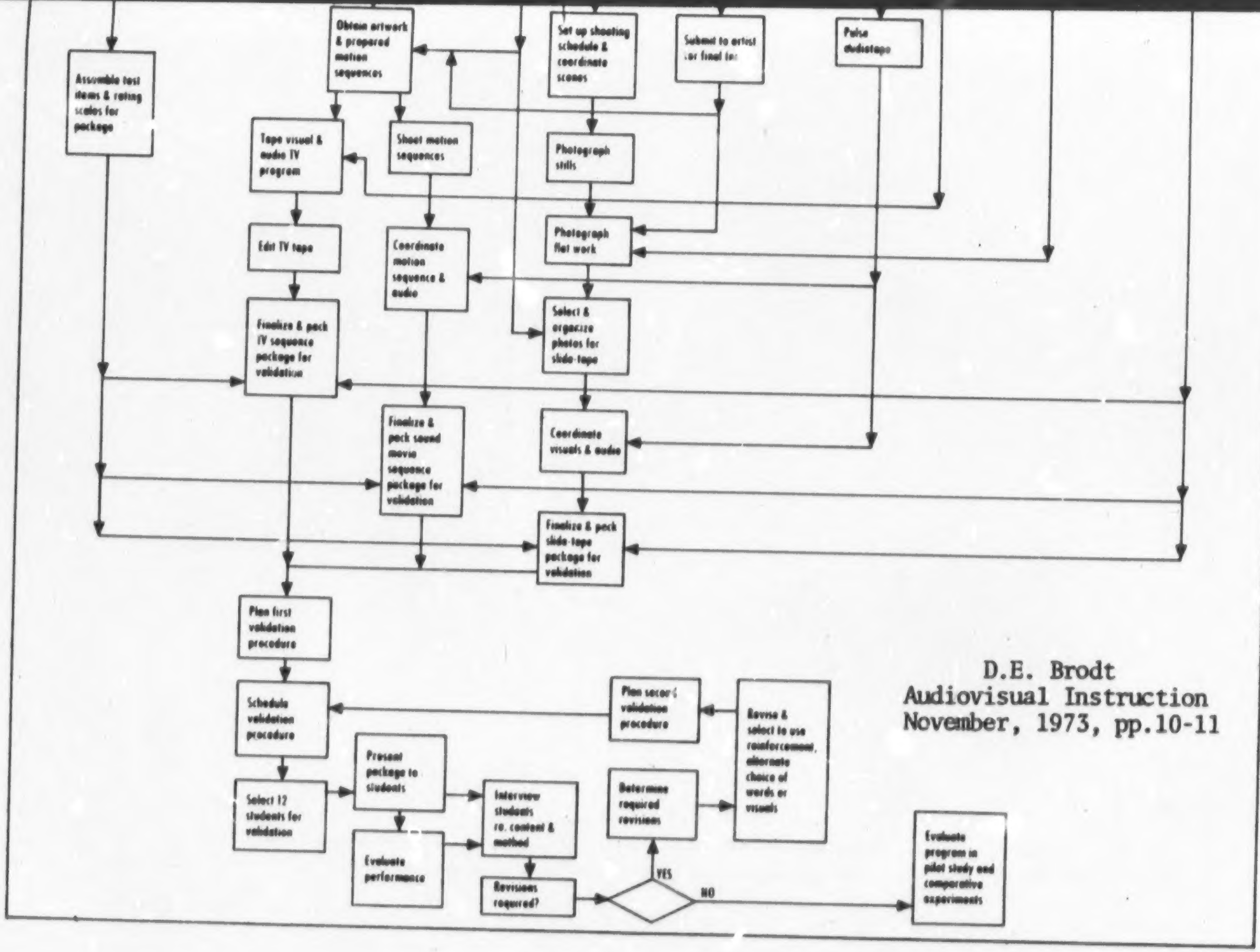

WRITE SPECIFIC OBJECTIVES
APPROVE OBJECTIVES
7
DECIDE ON TREATMENT OF CONTENT
APPROVE CONTENT TREATMENT
8
TYPE OF
COURSE
DETERMINE AVAILABLE MEDIA
ASSIGN MEDIA INSTRUCTIONAL TASKS
APPROVE MEDIA PRIORITIES
9
SCRIPT CONFERENCE FOR ALL MEDIA
APPROVE STIMULUS SITUATIONS
10
WRITE INDIVIDUAL SEGMENTS
APPROVE SCRIPTS AND COPY
11
PRODUCE LESSON SEGMENTS
APPROVE SEGMENTS
12
PREPARE POOL OF CRITERION TEST ITEMS
VALIDATE TEST ITEMS
APPROVE TEST ITEMS
INTEGRATE EMBEDDED TESTING


PRODUCE LESSON SEGMENTS
APPROVE SEGMENTS
12
ADD MEDIA BIAS TO TEST ITEMS FROM POOL
CONDUCT PROTOTYPE TESTING
13
CONDUCT INSTRUCTIONAL DIAGNOSIS
DECISION
14
15
REVISION OR REMAKE
REVISE
REMAKE
DECISION ON POINT TO RETURN
COMPILE MODULES INTO LESSONS
COMPILE SUMMATIVE TEST INSTRUMENT
16
FIELD TEST
17
OPERATIONAL DISSEMINATION
18
DATA ON ENROLLED STUDENTS
ANALYZE ACTUAL POPULATION
POPULATION FEASIBILITY REVIEW
19
VERIFY ACADEMIC REQUIREMENTS
DESCRIBE LEARNER EXPECTATIONS
CONTENT APPROPRIATENESS REVIEW
20
RECOGNIZE PERSONAL GOALS


PROCESS CHART FOR AUDIOVISUAL PROGRAMING

Assemble information on behavioral objectives
Post on 5 x 8 card with corresponding test item(s)
Sequence behavioral objectives into outline according to prerequisites
Determine type of learning for each objective (psycho-motor-cognition)
Use outline to divide program into modules or sections
Assign programer to each module or section*
Apply criteria for selection of media: motion, color, time
Identify & construct visual representation of content (story board)
Review existing mediated materials relevant to objectives
Obtain copyright clearance for approved materials
Prepare for insertion into program
Determine motion sequences
Determine stills & designate mode
Determine verbal support for visual representation
Draw up specifications for TV sequences
Draw up specifications for movie sequences
Draw up specifications for photos
Draw up specifications for artwork
Prepare script
Program content-plan student interaction
Sketch required artwork
Finalize script
Formulate questions & answers for program
Prepare worksheets
Request & obtain props
Submit to artist for first draft
Narrate script for slide tape & movies
Prepare questions & answers for photos
Assemble student handouts-inc. behavioral objectives
Select actors—practice & rehearse skills & scenes
Review & revise if necessary: first artwork draft
Edit audiotape

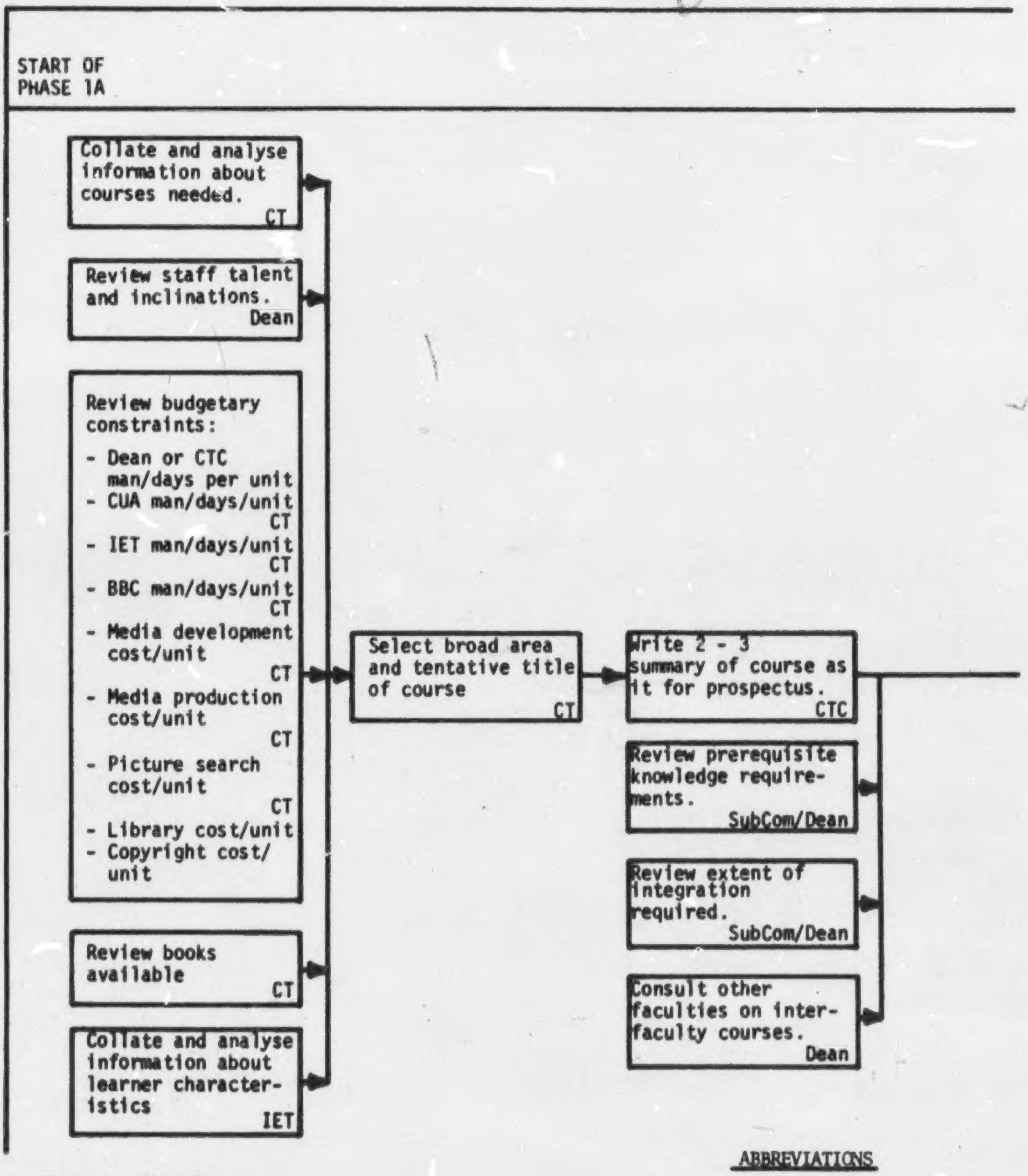
ANNEX J


Assemble test items & rating scales for package
Obtain artwork & prepared motion sequences
Set up shooting schedule & coordinate scenes
Submit to artist for final ink
Pulse audiotape
Tape visual & audio TV program
Shoot motion sequences
Photograph stills
Edit TV tape
Coordinate motion sequence & audio
Photograph flat work
Select & organize photos for slide-tape
Finalize & pack TV sequence package for validation
Finalize & pack sound movie sequence package for validation
Coordinate visuals & audio
Finalize & pack slide-tape package for validation
Plan first validation procedure
Schedule validation procedure
Plan second validation procedure
Revise & select to use reinforcement, alternate choice of words or visuals
Select 12 students for validation
Present package to students
Evaluate performance
Interview students re. content & method
Determine required revisions
Revisions required?
YES
NO
Evaluate program in pilot study and comparative experiments

D.E. Brodt
Audiovisual Instruction
November, 1973, pp.10-11

ANNEX

OPEN UNIVERSITY COURSE DEVELOPMENT (FROM LEWIS, II) MODIFIED

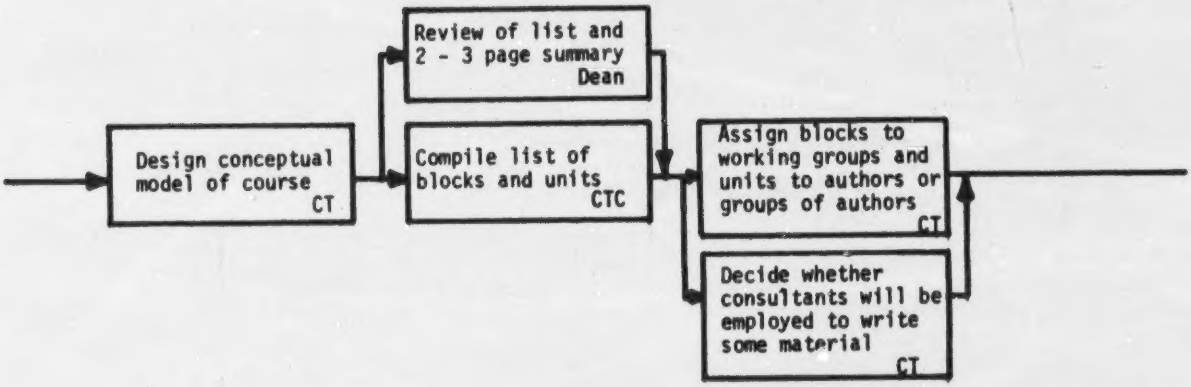

START OF
PHASE 1A
Collate and analyse information about courses needed. CT
Review staff talent and inclinations. Dean
Review budgetary constraints:
- Dean or CTC man/days per unit
- CUA man/days/unit CT
- IET man/days/unit CT
- BBC man/days/unit CT
- Media development cost/unit CT
- Media production cost/unit CT
- Picture search cost/unit CT
- Library cost/unit
- Copyright cost/unit
Review books available CT
Collate and analyse information about learner characteristics IET
Select broad area and tentative title of course CT
Write 2 - 3 summary of course as it for prospectus. CTC
Review prerequisite knowledge requirements. SubCom/Dean
Review extent of integration required. SubCom/Dean
Consult other faculties on inter-faculty courses. Dean

Phase 1 - Planning
  1A - Course Planning
  1B - Unit Planning
Phase 2 - Writing
  2A - Unit Writing
  2B - Developmental Testing
  2C - External Assessment
Phase 3 - Editing and Printing

ABBREVIATIONS

ARP	Audience Reaction Panel
CT	Course Team
CTC	Course Team Chairman
CUA	Course Unit Author
D1	Draft 1 of Unit
D2	Draft 2 of Unit
D3	Draft 3 of Unit
D4	Draft 4 of Unit
EA	External Assessor(s)

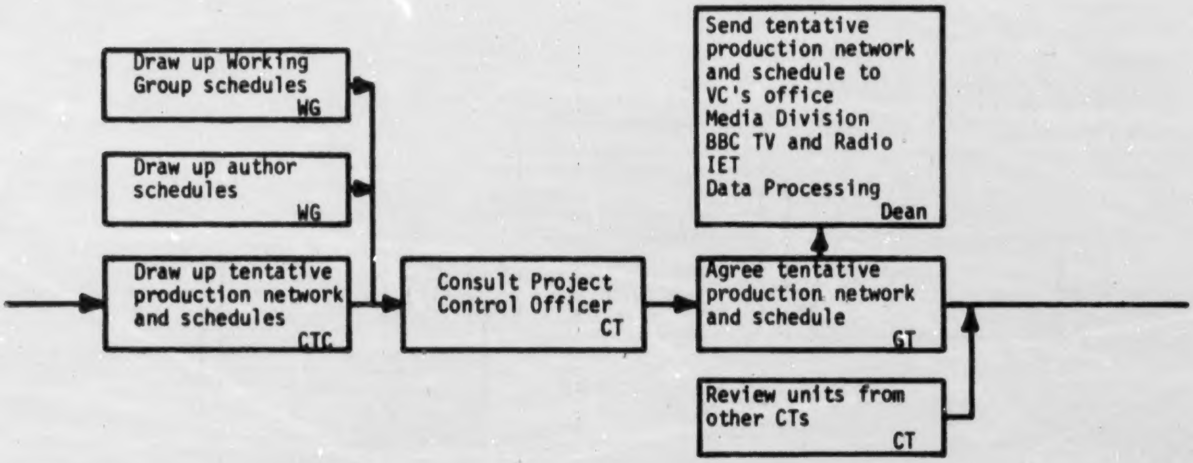
COURSE PLANNING


Design conceptual model of course
CT
Review of list and 2 - 3 page summary
Dean
Compile list of blocks and units
CTC
Assign blocks to working groups and units to authors or groups of authors
CT
Decide whether consultants will be employed to write some material
CT

Ed	Editor
IET	Inst. Ed. Technology
MDev	Media Evaluator
PO	Publishing Officer
SC	Student Consultants
Sub/com	Sub-Committee
WG	Working Group
VC	Vice-Chancellor

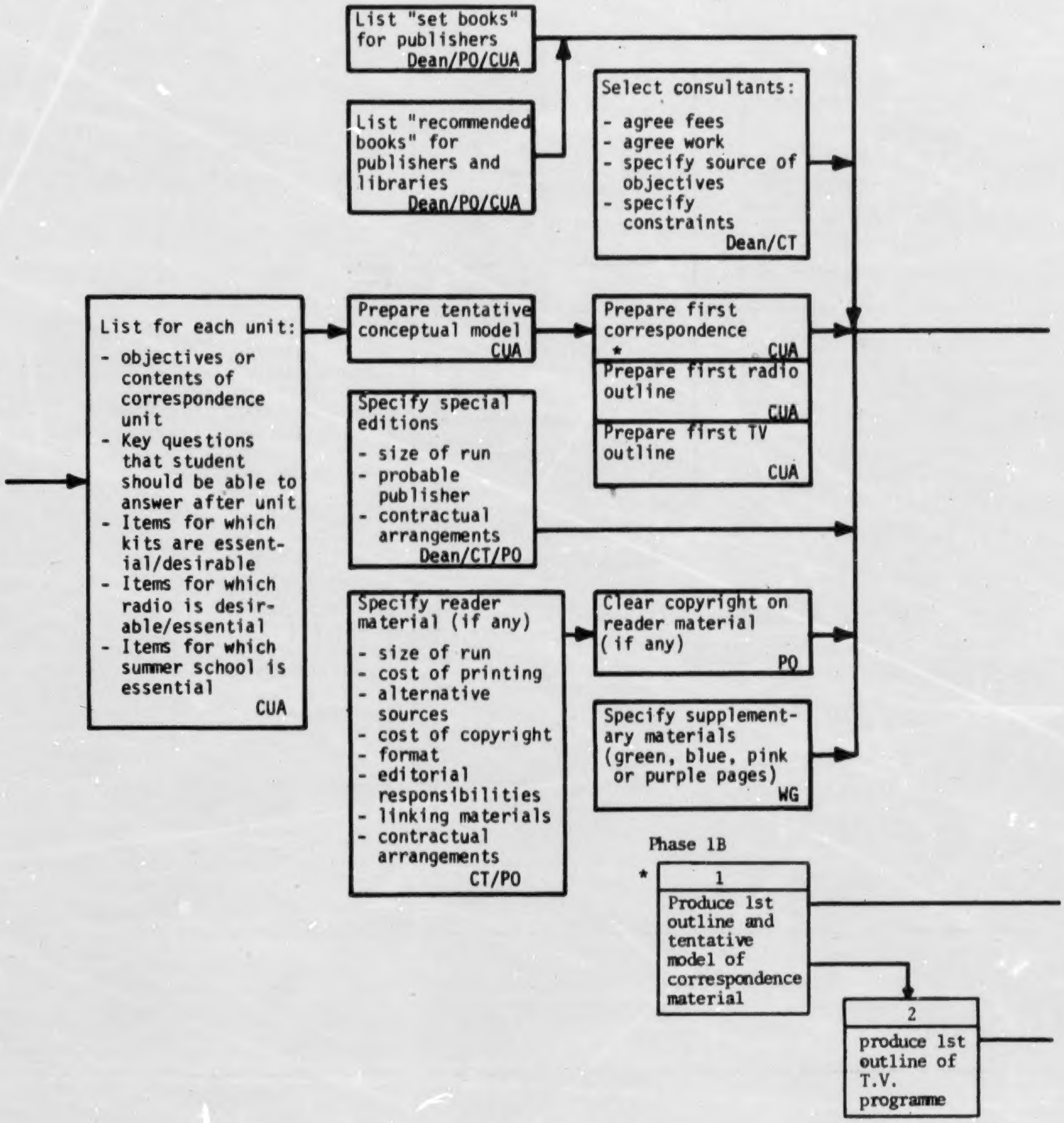
ANNEX K
(cont'd.)

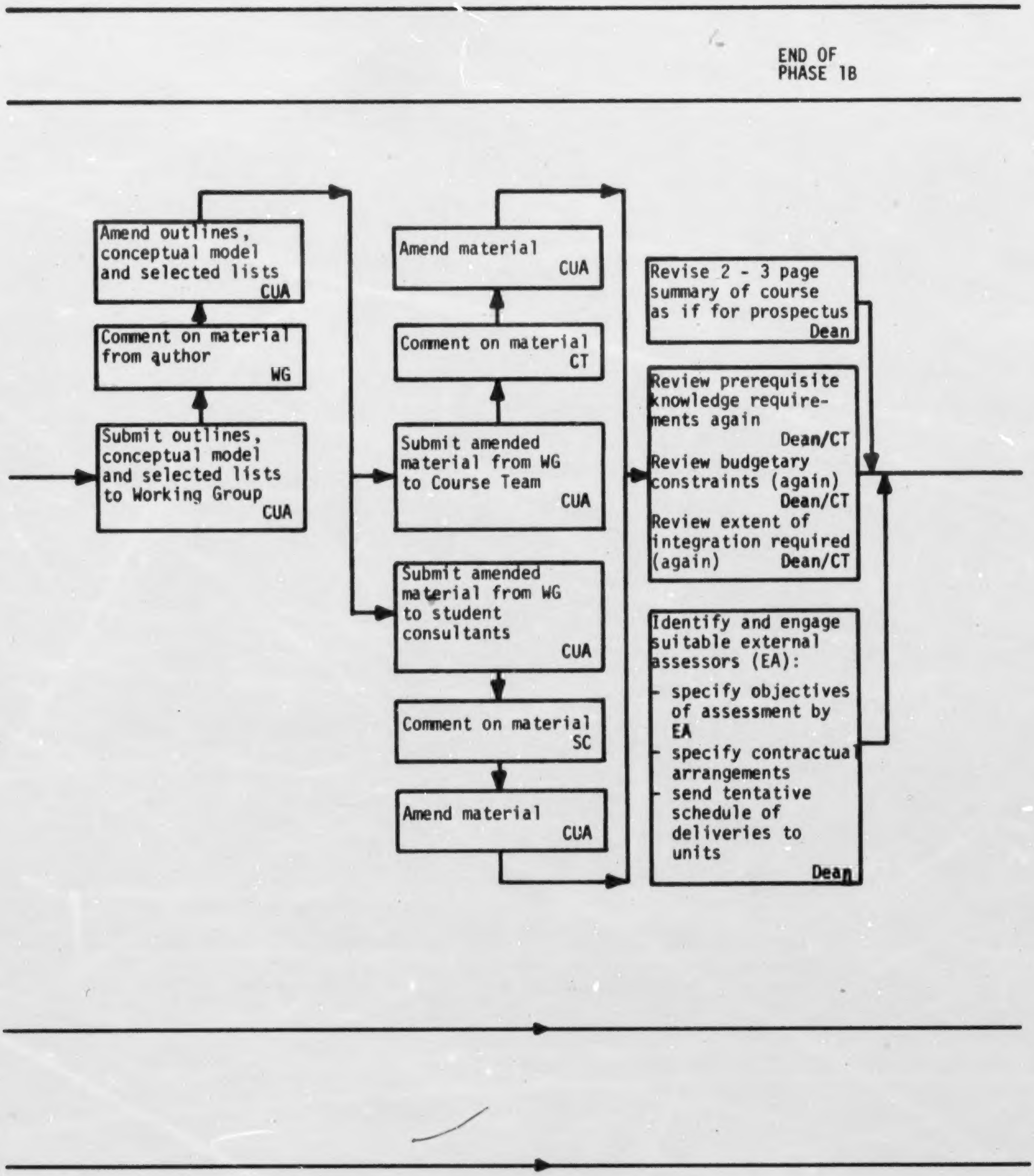
END OF
PHASE 1A

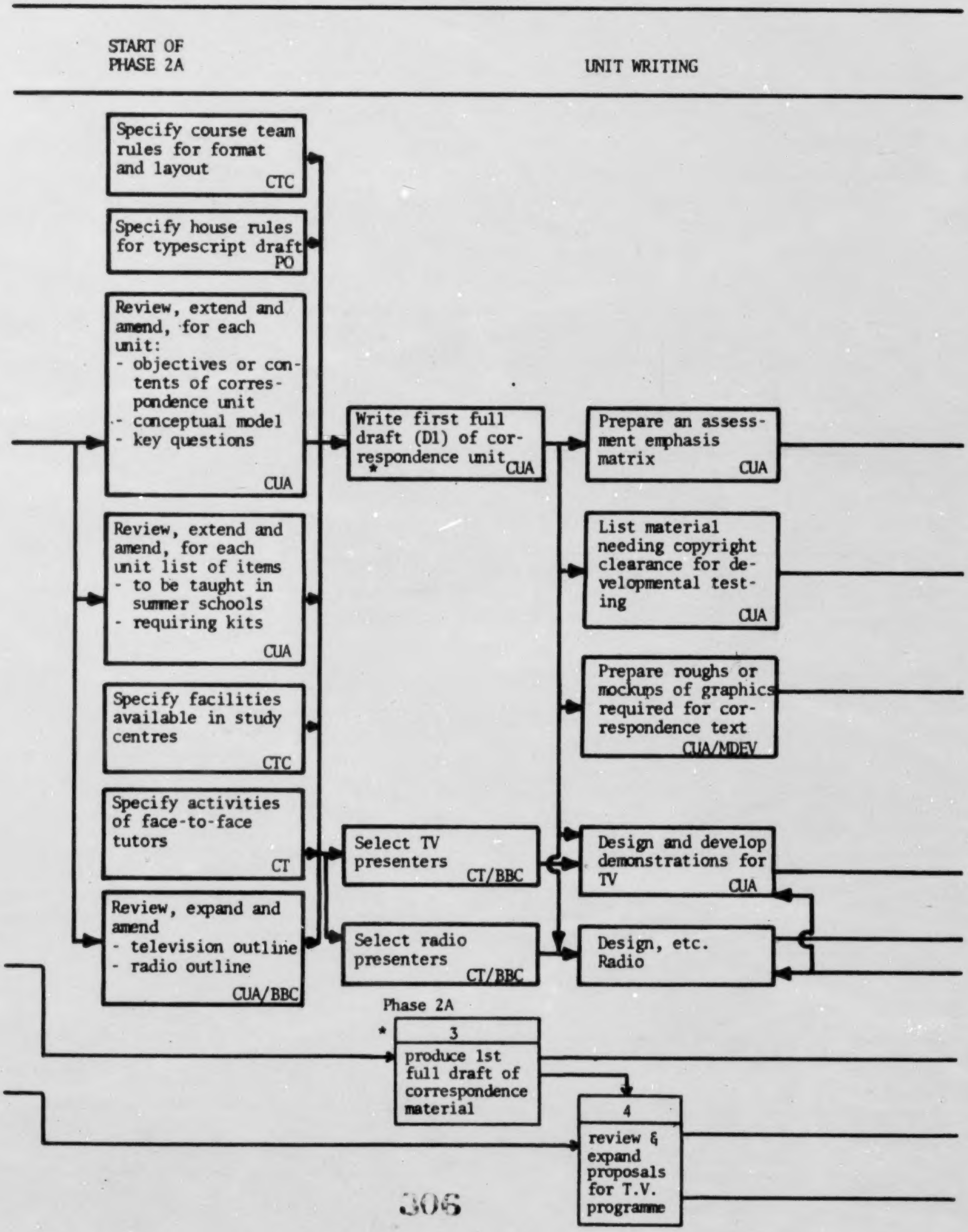

Draw up Working Group schedules
WG
Draw up author schedules
WG
Draw up tentative production network and schedules
CTC
Consult Project Control Officer
CT
Send tentative production network and schedule to
VC's office
Media Division
BBC TV and Radio
IET
Data Processing
Dean
Agree tentative production network and schedule
GT
Review units from other CTs
CT

START OF
PHASE 1B

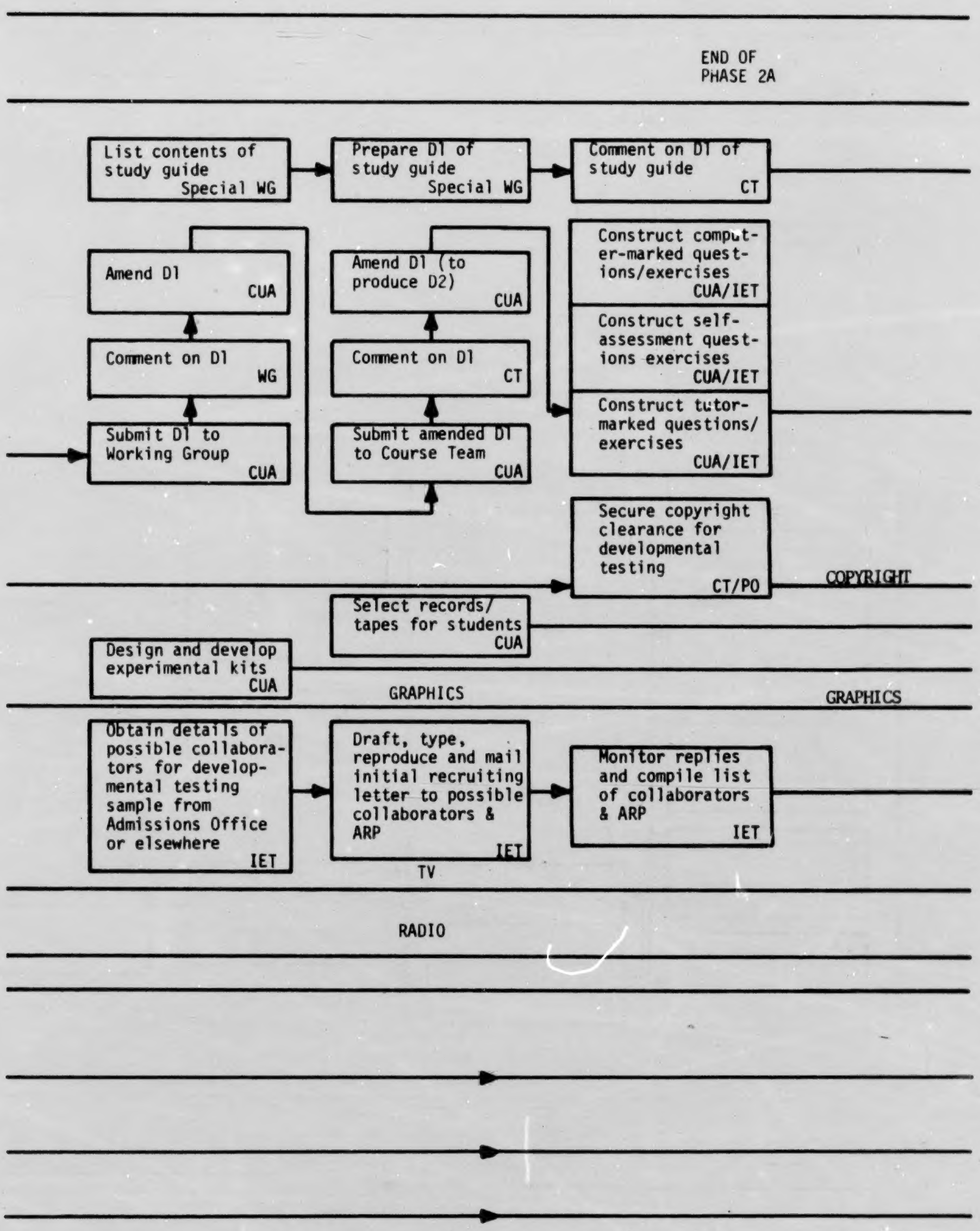
UNIT PLANNING

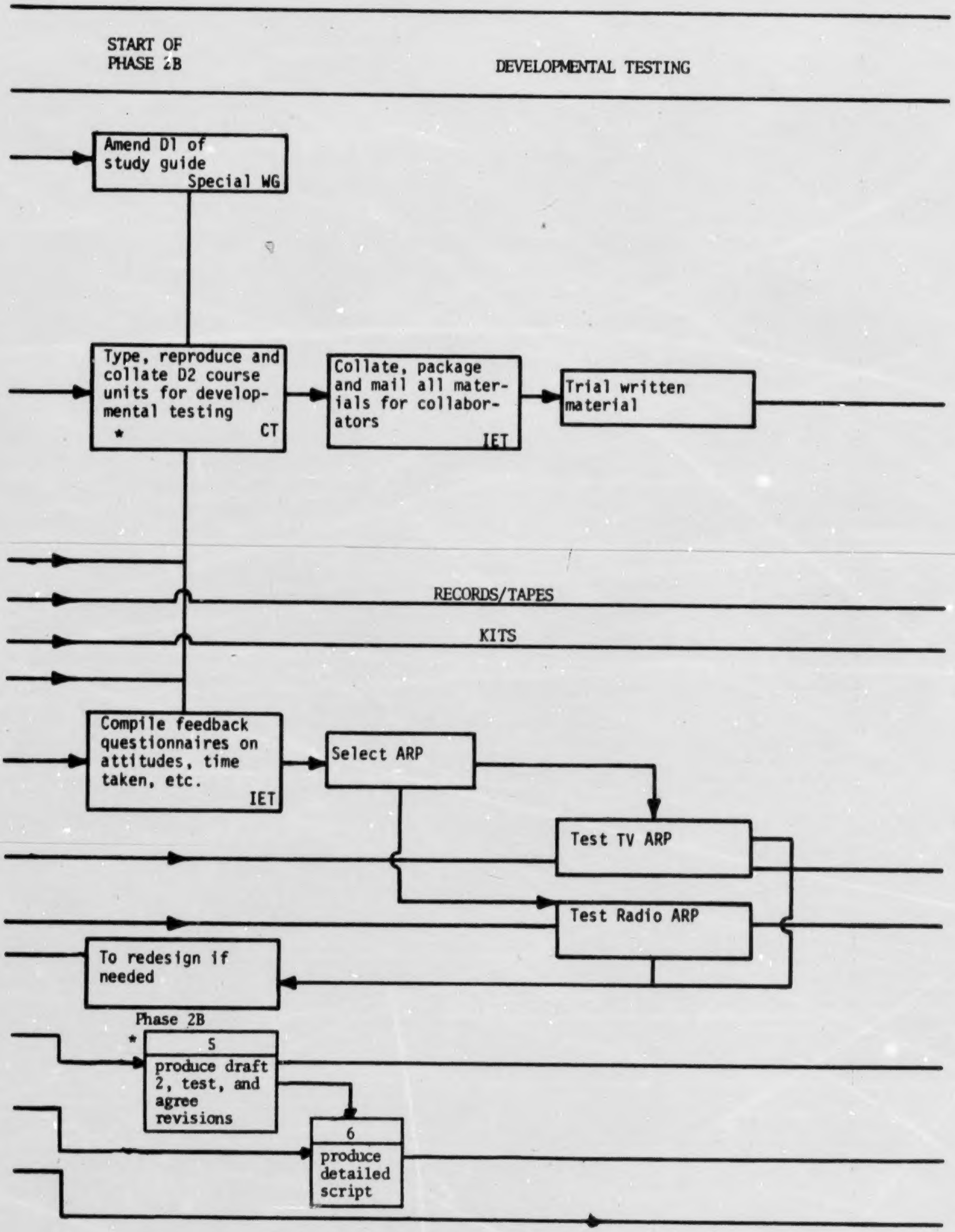

List "set books" for publishers Dean/PO/CUA
List "recommended books" for publishers and libraries Dean/PO/CUA
Select consultants:
- agree fees
- agree work
- specify source of objectives
- specify constraints
Dean/CT
List for each unit:
- objectives or contents of correspondence unit
- Key questions that student should be able to answer after unit
- Items for which kits are essential/desirable
- Items for which radio is desirable/essential
- Items for which summer school is essential
CUA
Prepare tentative conceptual model CUA
Prepare first correspondence * CUA
Prepare first radio outline CUA
Prepare first TV outline CUA
Specify special editions
- size of run
- probable publisher
- contractual arrangements
Dean/CT/PO
Specify reader material (if any)
- size of run
- cost of printing
- alternative sources
- cost of copyright
- format
- editorial responsibilities
- linking materials
- contractual arrangements
CT/PO
Clear copyright on reader material (if any) PO
Specify supplementary materials (green, blue, pink or purple pages) WG
Phase 1B
* 1
Produce 1st outline and tentative model of correspondence material
2
produce 1st outline of T.V. programme

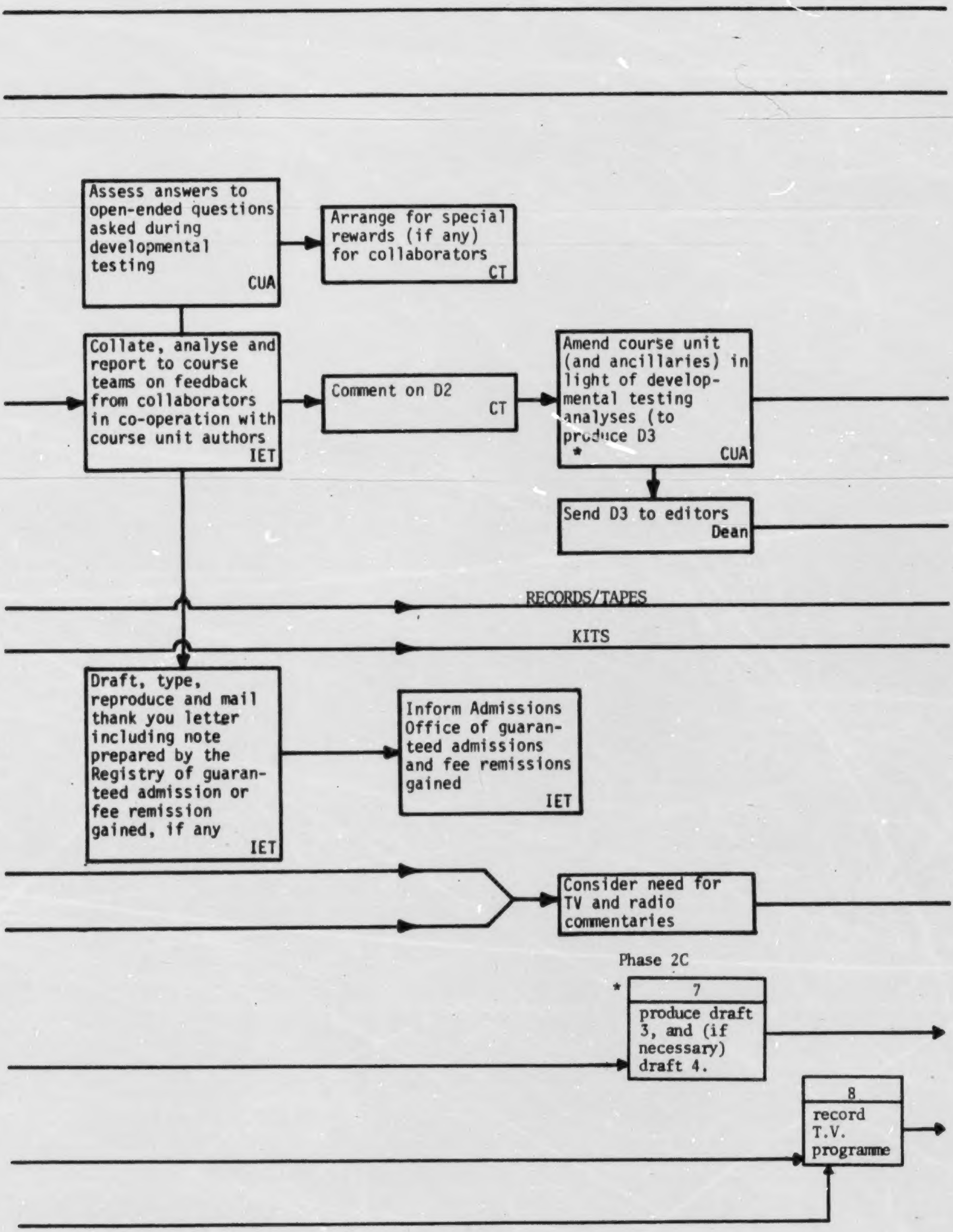

END OF PHASE 1B
Submit outlines, conceptual model and selected lists to Working Group CUA
Comment on material from author WG
Amend outlines, conceptual model and selected lists CUA
Submit amended material from WG to Course Team CUA
Comment on material CT
Amend material CUA
Submit amended material from WG to student consultants CUA
Comment on material SC
Amend material CUA
Revise 2 - 3 page summary of course as if for prospectus Dean
Review prerequisite knowledge requirements again Dean/CT
Review budgetary constraints (again) Dean/CT
Review extent of integration required (again) Dean/CT
Identify and engage suitable external assessors (EA):
- specify objectives of assessment by EA
- specify contractual arrangements
- send tentative schedule of deliveries to units
Dean

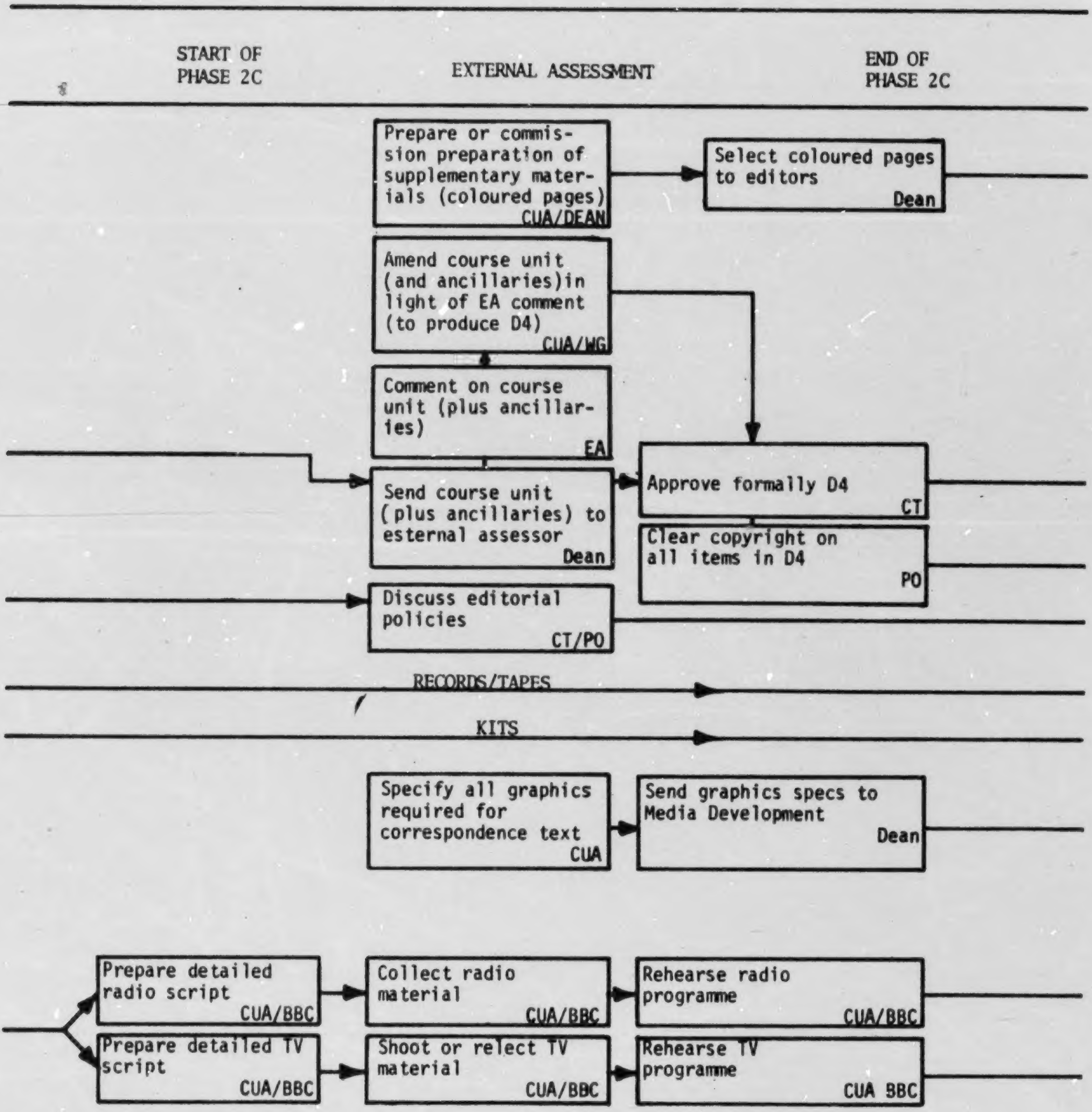

START OF PHASE 2A
UNIT WRITING
Specify course team rules for format and layout CTC
Specify house rules for typescript draft PO
Review, extend and amend, for each unit: - objectives or contents of correspondence unit - conceptual model - key questions CUA
Review, extend and amend, for each unit list of items - to be taught in summer schools - requiring kits CUA
Specify facilities available in study centres CTC
Specify activities of face-to-face tutors CT
Review, expand and amend - television outline - radio outline CUA/BBC
Write first full draft (D1) of correspondence unit CUA
*
Select TV presenters CT/BBC
Select radio presenters CT/BBC
Prepare an assessment emphasis matrix CUA
List material needing copyright clearance for developmental testing CUA
Prepare roughs or mockups of graphics required for correspondence text CUA/MDEV
Design and develop demonstrations for TV CUA
Design, etc. Radio
Phase 2A
*
3
produce 1st full draft of correspondence material
4
review & expand proposals for T.V. programme

ANNEX K
(cont'd.)

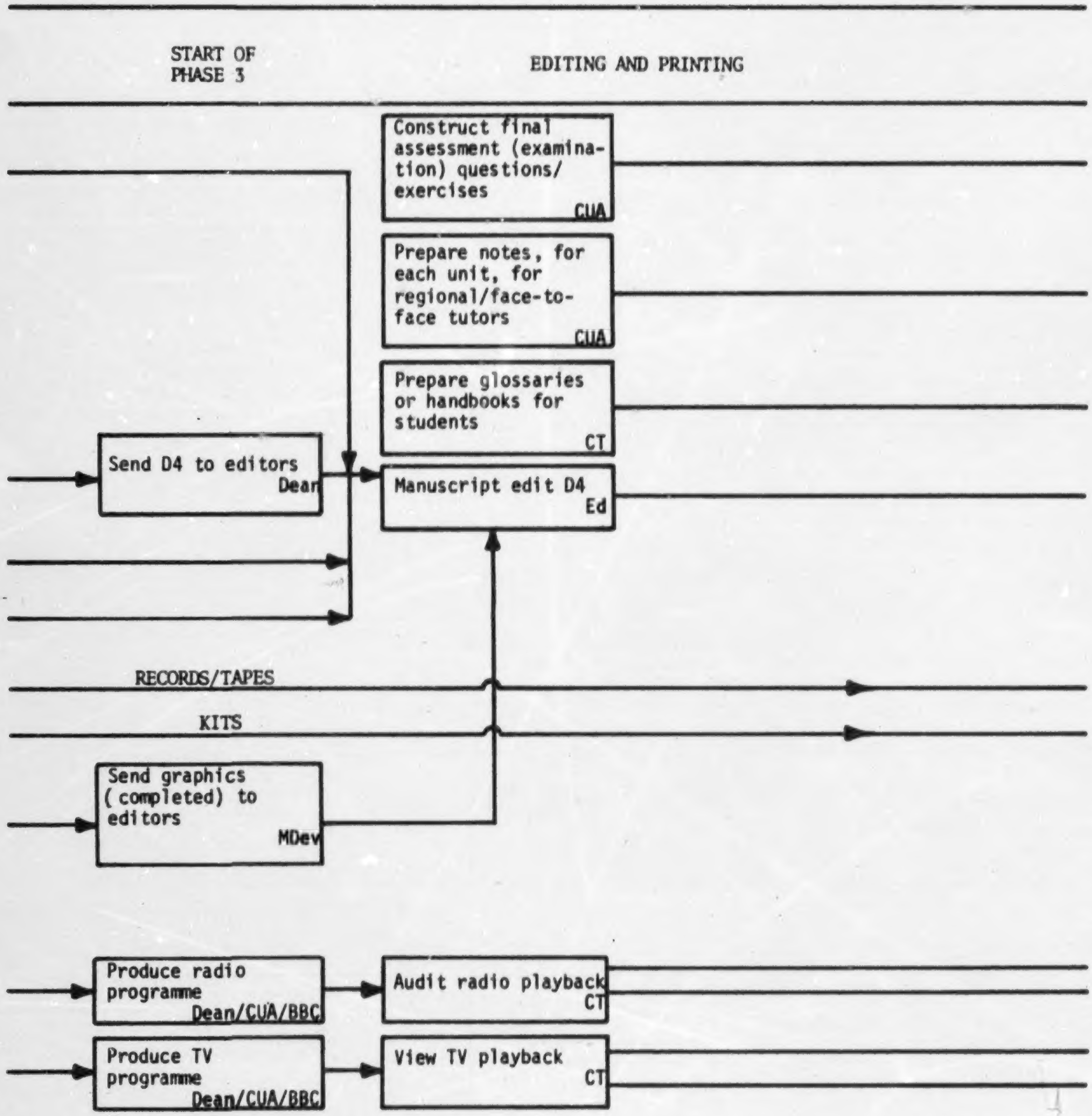

END OF PHASE 2A
List contents of study guide Special WG
Prepare D1 of study guide Special WG
Comment on D1 of study guide CT
Amend D1 CUA
Comment on D1 WG
Submit D1 to Working Group CUA
Amend D1 (to produce D2) CUA
Comment on D1 CT
Submit amended D1 to Course Team CUA
Construct computer-marked questions/exercises CUA/IET
Construct self-assessment questions exercises CUA/IET
Construct tutor-marked questions/exercises CUA/IET
Secure copyright clearance for developmental testing CT/PO
COPYRIGHT
Select records/tapes for students CUA
Design and develop experimental kits CUA
GRAPHICS
GRAPHICS
Obtain details of possible collaborators for developmental testing sample from Admissions Office or elsewhere IET
Draft, type, reproduce and mail initial recruiting letter to possible collaborators & ARP IET
Monitor replies and compile list of collaborators & ARP IET
TV
RADIO


START OF PHASE 2B
DEVELOPMENTAL TESTING
Amend D1 of study guide Special WG
Type, reproduce and collate D2 course units for developmental testing * CT
Collate, package and mail all materials for collaborators IET
Trial written material
RECORDS/TAPES
KITS
Compile feedback questionnaires on attitudes, time taken, etc. IET
Select ARP
Test TV ARP
Test Radio ARP
To redesign if needed
Phase 2B
* 5 produce draft 2, test, and agree revisions
6 produce detailed script

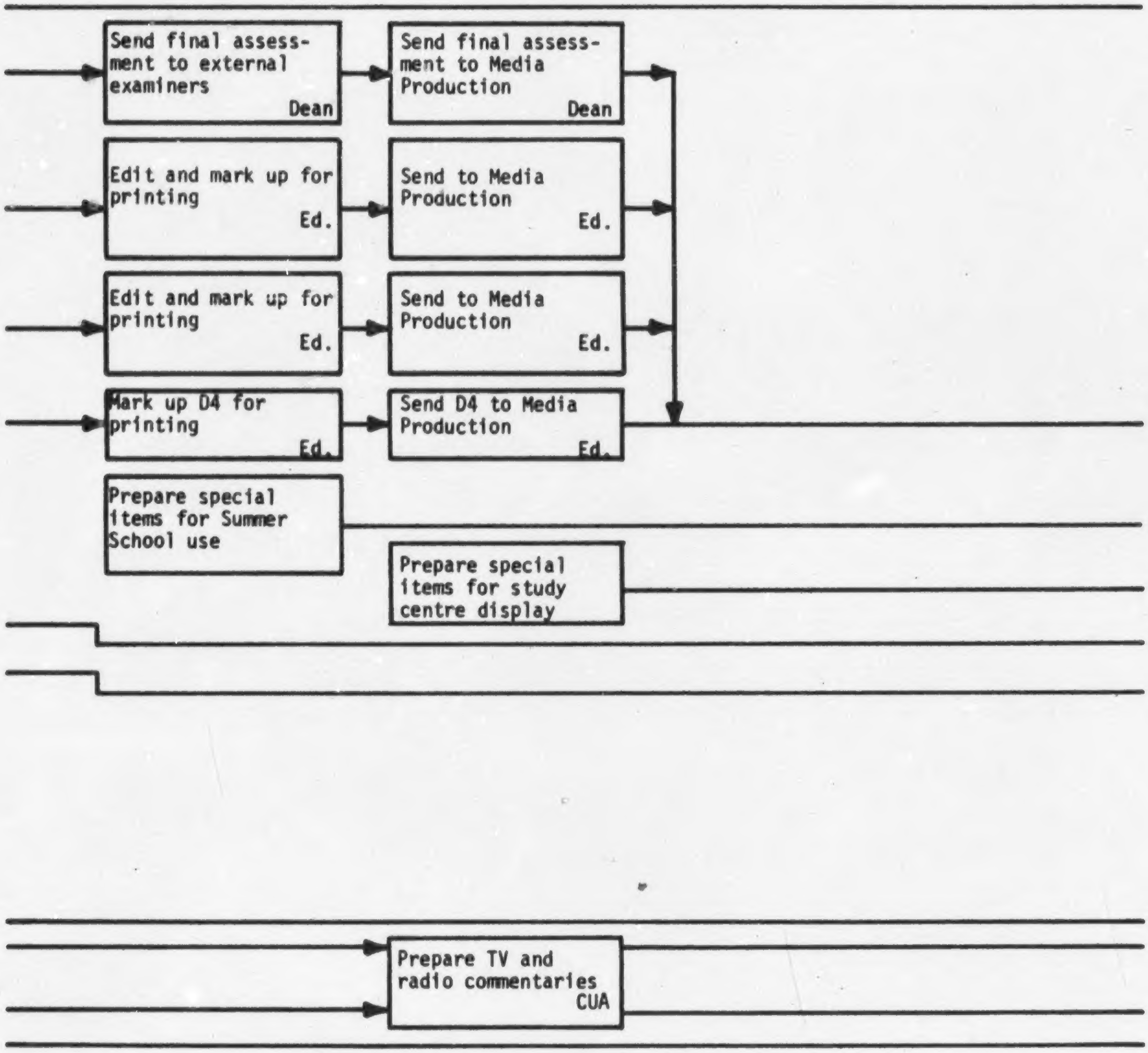

Assess answers to open-ended questions asked during developmental testing CUA
Arrange for special rewards (if any) for collaborators CT
Collate, analyse and report to course teams on feedback from collaborators in co-operation with course unit authors IET
Comment on D2 CT
Amend course unit (and ancillaries) in light of developmental testing analyses (to produce D3 * CUA
Send D3 to editors Dean
RECORDS/TAPES
KITS
Draft, type, reproduce and mail thank you letter including note prepared by the Registry of guaranteed admission or fee remission gained, if any IET
Inform Admissions Office of guaranteed admissions and fee remissions gained IET
Consider need for TV and radio commentaries
Phase 2C
* 7 produce draft 3, and (if necessary) draft 4.
8 record T.V. programme

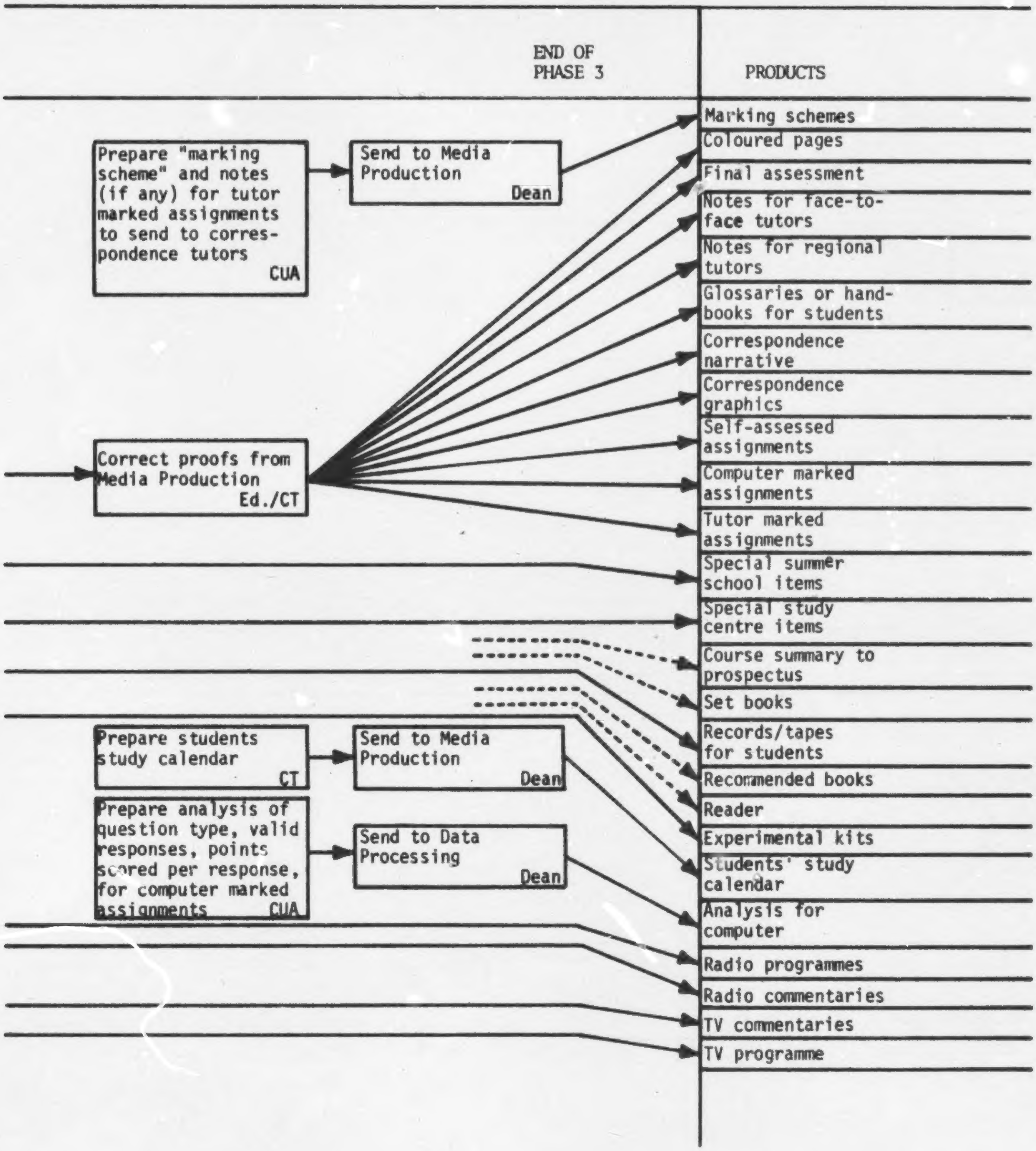

START OF PHASE 2C
EXTERNAL ASSESSMENT
END OF PHASE 2C
Prepare or commission preparation of supplementary materials (coloured pages) CUA/DEAN
Select coloured pages to editors Dean
Amend course unit (and ancillaries) in light of EA comment (to produce D4) CUA/WG
Comment on course unit (plus ancillaries) EA
Send course unit (plus ancillaries) to esternal assessor Dean
Approve formally D4 CT
Clear copyright on all items in D4 PO
Discuss editorial policies CT/PO
RECORDS/TAPES
KITS
Specify all graphics required for correspondence text CUA
Send graphics specs to Media Development Dean
Prepare detailed radio script CUA/BBC
Collect radio material CUA/BBC
Rehearse radio programme CUA/BBC
Prepare detailed TV script CUA/BBC
Shoot or relect TV material CUA/BBC
Rehearse TV programme CUA BBC

ANNEX K
(cont'd.)


START OF PHASE 3
EDITING AND PRINTING
Construct final assessment (examination) questions/exercises CUA
Prepare notes, for each unit, for regional/face-to-face tutors CUA
Prepare glossaries or handbooks for students CT
Send D4 to editors Dean
Manuscript edit D4 Ed
RECORDS/TAPES
KITS
Send graphics (completed) to editors MDev
Produce radio programme Dean/CUA/BBC
Audit radio playback CT
Produce TV programme Dean/CUA/BBC
View TV playback CT

EDITING AND PRINTING


Send final assessment to external examiners
Dean
Send final assessment to Media Production
Dean
Edit and mark up for printing
Ed.
Send to Media Production
Ed.
Edit and mark up for printing
Ed.
Send to Media Production
Ed.
Mark up D4 for printing
Ed.
Send D4 to Media Production
Ed.
Prepare special items for Summer School use
Prepare special items for study centre display
Prepare TV and radio commentaries
CUA


END OF PHASE 3
PRODUCTS
Prepare "marking scheme" and notes (if any) for tutor marked assignments to send to correspondence tutors CUA
Send to Media Production Dean
Correct proofs from Media Production Ed./CT
Prepare students study calendar CT
Send to Media Production Dean
Prepare analysis of question type, valid responses, points scored per response, for computer marked assignments CUA
Send to Data Processing Dean
Marking schemes
Coloured pages
Final assessment
Notes for face-to-face tutors
Notes for regional tutors
Glossaries or handbooks for students
Correspondence narrative
Correspondence graphics
Self-assessed assignments
Computer marked assignments
Tutor marked assignments
Special summer school items
Special study centre items
Course summary to prospectus
Set books
Records/tapes for students
Recommended books
Reader
Experimental kits
Students' study calendar
Analysis for computer
Radio programmes
Radio commentaries
TV commentaries
TV programme

BIBLIOGRAPHY

ALKIN, Marvin C. *Towards an Evaluation Model: A Systems Approach.* Working Paper No. 4. Los Angeles: University of California, Centre for the Study of Evaluation of Instructional Programs, August, 1967.

American Institutes for Research. *Evaluative Research: Strategies and Methods.* Pittsburgh, Pennsylvania: American Institutes for Research, 1970.

ANDERSON, David A. and Thomas R. Flores. "Implementing systematic evaluation within an ongoing educational program". *Educational Technology*, June, 1973, pp. 43-48.

ANDERSON, S.D., S. Bell, R. Murphy, E. Rosenthel (eds.). *Evaluation of Educational Training Programs. An Encyclopedia of Concepts and Techniques.* Educational Testing Service for Office of Naval Research, 1973.

AUMACK, Lewis. *Poverty Research in Field Settings: Methods, Issues, Foul-Ups and Social Ethics.* Alberta NewStart Inc., November, 1971.

BALL, S. and G.A. Bogatz. *The First Year of Sesame Street: An Evaluation.* Educational Testing Service, 1970.

BATES, A.W. "The evaluation of broadcasting at the open university". Paper presented to Annual Conference Association for Programmed Learning and Educational Technology, University of Batu, March 31 - April 4, 1972a.

BATES, A.W. *Description of the Open University (United Kingdom).* Mimeo. paper, 1972b.

BATES, A.W. "Educational and cost comparisons between open-network, cable and cassette systems of multi-media teaching". Paper presented at Eighth Mediorama for the Development of Industry and Labour, Blankenberge, Belgium, May 16-18, 1973b.

BATES, A.W. "An evaluation of the effect of basing assignments on broadcasts in a multi-media teaching system". *Programmed Learning and Educational Technology*, 1973a, *10*. No. 5.

BENNETT, Claude F. "Theory and strategy for evaluation of knowledge dissemination". Washington, D.C.: Extension Service-USDA, Program and Staff Development, 1973.

BEREITER, C., "Some persisting dilemmas in the measurement of change" in C.W. Harris (ed.) Problems in Measuring Change. University of Wisconsin Press, 1963, pp. 3-20.

BERLAK, Harold, "Values, goals, public policy and educational evaluation". Review of Educational Research, 1970, 40 (April).

BLALOCK, H.M., Jr. Casual Inferences in Nonexperimental Research. University of North Carolina Press, 1964.

BLOOM, B.S., J. Thomas Hastings, and George F. Madaus. Handbook on Formative and Summative Evaluation of Student Learning. McGraw-Hill Book Company, 1971.

BORUS, Michael E., and William R. Tash. Measuring the Impact of Manpower Programs: A Primer. The University of Michigan--Wayne State University. Institute of Labor and Industrial Relations, 1970.

BOYLE, P.G. and Irwin R. Jahns. "Program Development and Evaluation". In Robert M. Smith, George F. Aker, and J.R. Kidd, (eds.) Handbook of Adult Education.

BRODT, D.E. "Task analysis for the development of audiovisual programed instruction modules" Audiovisual Instruction, 1973, November, pp. 8, 10-11.

BYRN, Darcie, ed. Evaluation in Extension. H.M. Ives and Sons, Inc., 1959.

CAIN, Glen G. and Robinson G. Hollister. The Methodology of Evaluating Social Action Programs. University of Wisconsin. Institute for Research on Poverty. n.d.

CAMPBELL, D.T. 'Methodological suggestions from a comparative psychology of knowledge processes". Inquiry, 1959, 2, pp. 152-182.

CAMPBELL, D.T. "Administrative experimentation, institutional records and nonreactive measures" in J.C. Stanley and S.M. Elam (eds.) Improving Experimental Design and Statistical Analysis. Rand McNally, 1966, pp. 257-291.

CAMPBELL, D.T. "Reforms as experiments". American Psychologist, 1969, 24, pp. 409-429.

CAMPBELL, D.T., and Stanley, J.C. Experimental and Quasi-Experimental Designs for Research. Rand McNally, 1963.

CARO, Francis G., ed. Readings in Evaluation Research. Russell Sage Foundation, 1971.

CAVERT, C.E. An Approach to the Design of Mediated Instruction. The Association for Educational Communications and Technology Publications, 1974.

CAVERT, C.E. Procedural Guidelines for the Design of Mediated Instruction. The Association for Educational Communications and Technology Publications, 1974.

CHU, G.C. and W. Schramm. Learning From Television: What the Research Says. National Association of Educational Broadcasters, 1967.

CHOEN, D. "Politics and research: Evaluation of social action programs in education". Review of Educational Research, v.30, pp. 213-38.

Committee on Evaluation. Program Evaluation in Adult Education. Adult Educational Association of the U.S.A., 1952.

CONGER, D.S. Social Inventions. Information Canada, Prince Albert, Saskatchewan, 1973.

COREY, Stephen M. Action Research to Improve School Practices. Columbia University, Teachers College, 1953.

CRANE, Peter and Clark C. Abt. "A model for curriculum evaluation". Educational Technology, 1969, 9, (October), pp. 17-25.

CURTISS, P. and P.W. Warren. The Dynamics of Life Skills Coaching. Information Canada, Prince Albert, Saskatchewan, 1973.

DENISTON, O.L., I.M. Rosenstock, W. Welch, and V.A. Getting. "Evaluation of Program Efficiency". Public Health Reports, 1968, 83, (No. 7).

DENNY, T., (issue editor). "Educational Evaluation". Review of Educational Research, 1970, 40, (Number 2, April).

DIRR, Peter. "An interim report on Britain's Open University". Educational Television, 1971, (December), pp. 17-18, 27.

DOBY, J.T. (ed). An Introduction to Social Research. The Stockpole Company. Harrisburg, Pennsylvania, 1954.

DWYER, F.M. A Guide for Improving Visualized Research. State College, Pennsylvania. Learning Services, 1972.

EASH, J. "The politics of curriculum evaluation research". In J. Weiss, (ed). Curriculum Theory Network. The Ontario Institute for Studies in Education, 1972.

ETIZIONI, Amitai. "Two approaches to organizational analysis: A critique and a suggestion". In Herbert C. Schulberg, Alan Sheldon, and Frank Baker (ed.) Program Evaluation in the Health Fields, Behavioral Publications, Inc., 1969, pp. 101-20.

ETIZIONI, A. and Edward W. Lehman. "Some dangers in 'valid' social measurement". The Annals of the American Academy, 1967, 2, (September), pp. 1-15.

Evaluation Comment. Los Angeles: University of California, Center for the Study of Evaluation. (Periodical).

Evaluation of Education. Educational Technology Publications, 1973.

FOREHAND, Garlie A. "An Evaluation System for Curriculum Innovation". *Teacher's College Record*, 1971, *72*, (May), pp. 576-91.

FREEMAN, Howard E., and Clarence C. Sherwood. *Social Research and Social Policy*. Prentice-Hall, Inc., 1970.

FURST, Edward J. *Constructing Evaluation Instruments*. David McKay Co., Inc., 1964.

GERLACH, Vernon S. and Donald P. Ely. *Teaching and Media: A Systematic Approach*. Prentice-Hall, 1971.

GILLETT, Margaret. *Educational Technology: Toward Demystification*. Prentice-Hall, 1973.

GLASS, Gene V. "Educational product evaluation: A prototype format applied". *Educational Researcher*, 1972, (January), pp. 7-10.

GLASS, G.V. and B. Worthen. "Educational evaluation and research: Similarities and differences". In J. Weiss (ed.), *Curriculum Theory Network*, The Ontario Institute for Studies in Education, 1972.

GOTTMAN, John Moredechai, and Robert Earl Clasen. *Evaluation in Education: A Practioner's Guide*. F.E. Peacock Publishers, Inc., 1972.

GROBMAN, Hulda. *Evaluation Activities of Curriculum Projects*. Rand McNally and Co., 1968.

GUBA, E.G. "The failure of educational evaluation". *Educational Technology*, 1969, *9*, pp. 29-38.

HAMMOND, Robert L. *Evaluation at the Local Level*. Ohio State University Evaluation Center, 1967.

HARRIS, C.W. (ed). *Problems of Measuring Change*. University of Wisconsin Press, 1963.

HEMPHILL, J.K. "The relationship between research and evaluation studies". In R.W. Tyler (ed.), *Educational Evaluation: New Roles, New Means*, National Society for the Study of Education, 1969.

HERRIOTT, R.E. and R.J.. Liebert. *"The Electric Company" In-School Utilization Study. Vol. 1: The 1971-72 School and Teacher Surveys*. Institute for Social Research. Florida State University, 1972.

HERZOG, Elizabeth. Some Guidelines for Evaluative Research. U.S. Department of Health, Education, and Welfare. Social Security Administration, 1959.

Kentucky Educational Television. GED Project: ARC Contract 72-14/RP-0179: Final Report. July 25, 1973.

KIRKPATRICK, Donald L. "Evaluation of training". In Robert L. Craig and Lester R. Bittel (ed.), Training and Development Handbook, McGraw-Hill Book Company, 1967, pp. 87-112.

KNOX, Alan B. "Continuous program evaluation". In Nathan C. Shaw (ed)., Administration of Continuing Education, National Association for Public School Education, 1969.

KNOX, A.B. Program Evaluation in Adult Basic Education. Florida State University. Adult Education Research Information. Processing Center, 1971.

KNOX, A.B., Jack Mezirow, and Gordon G. Darkenwald. Evaluating Adult Basic Education: A Strategy and a Manual. Columbia University, Teachers College. Center for Adult Education, 1973.

KREITLOW, Burton W. Indiana Adult Basic Education--An Improvement Evaluation. Indianapolis, Indiana: State Department of Public Instruction, 1972.

KROPP, Russell P., and Coolie Verner. "An attitude-scale technique for evaluating meetings". Adult Education, 1957, 7, (Summer), pp. 212-215.

KRUGMAN, H.E. "Brain wave measures of media involvement". Journal of Advertising Research, 1971, 11, (#1, February), pp. 3-9.

LAMROCK, L.A., A.D. Smith, and P.W. Warren. Evaluation: Its Scope and Systems for Evaluation Development. Paper prepared for Meeting of Research Directors of NewStart Corporations, Ottawa, Canada. March 29-31. Saskatchewan NewStart, Inc., 1971.

LANGE, Robert R. "Evaluation as management methodology". In Casper, F. Paulson, Jr., (ed), A Strategy for Evaluation Design, Oregon State System of Higher Education, 1970, Section VII.

LEWIS, B., "Course production at the Open University I: Some basic problems". British Journal of Educational Technology, 1971a, 2, (1), pp. 4-13.

LEWIS, B. "Course production at the Open University II: Activities and activity networks". British Journal of Educational Technology, 1971b, 2, pp. 111-123.

LEWIS, B., "Course production at the Open University III: Planning and scheduling". *British Journal of Educational Technology,* 1971c, *2*, (3), pp. 184-204.

LEWIS, B., "Course production at the Open University IV: The problem of assessment". *British Journal of Educational Technology*, 1972, *3*, (2), pp. 108-128.

LINC (Learning Individualized for Canadians), Saskatchewan NewStart and Training Research and Development Station, Prince Albert, Saskatchewan, 1972.

LINDVALL, C.M., and Richard Cos. *The IPI Evaluation Program.* AERA Monograph Series on Curriculum Evaluation, Rand McNally and Company, 1970.

McGUIRE, Thomas O. "Decisions and curriculum objectives: A methodology for evaluation". *Alberta Journal of Educational Research*, 1969, *15*, (March), pp. 17-30.

McINTOSH, N.E., "Research for a new institution: the Open University", in *Innovation in Higher Education.* Society for Research in Higher Education, London, 1972a, pp. 31-60.

McINTOSH, Naomi E. *Students of the Open University - Their Background and Progress.* The Open University Press, 1972b.

McINTOSH, Naomi E. and A.W. Bates. "Mass-media courses for adults". *Programmed Learning,* 1972, (July), pp. 188-197.

MAGER, R.F. *Preparing Instructional Objectives.* Fearon Publishers/Lear Siegler, Inc. Educational Division, 1962.

MAGER, Robert F. *Goal Analysis.* Fearon Publishers/Lear Siegler, Inc. Educational Division, 1972.

MERWIN, Jack D., and Frank B. Womer. "Evaluation in assessing the progress of education to provide bases of public understanding and public policy". In Ralph Tyler (ed.), *Educational Evaluation: New Roles, New Means*, The University of Chicago, 1970, pp. 306-12.

MILLER, Harry L., and Christine H. McGuire. *Evaluating Liberal Adult Education.* Chicago: Center for the Study of Liberal Education for Adults, 1961.

NEIL, M.W. "A systems approach to course planning in the Open University". In A.J. Romiszowski (ed)., *The Systems Approach to Education and Training*, Kogan Page, 1970.

NIEMI, J.A. (ed.) *Mass Media and Adult Education.* Educational Technology Publications, 1971.

OHLIGER, John. The Mass Media in Adult Education: A Review of Recent Literature. ERIC Clearinghouse on Adult Education, 1968.

PALMER, E.L. "Formative research in educational television production: The experiences of the Children's Television Workshop". In W. Schram (ed.), Quality in Instructional Television, The University Press of Hawaii, 1972.

POPHAM, W. James. An Evaluation Guidebook. Los Angeles: The Instructional Objectives Exchange, 1972.

POPHAM, W.J., Elliot W. Eisner, Howard J. Sullivan, and Louise L. Tyler. Instructional Objectives. AERA Monograph Series on Curriculum Evaluation. No. 3, Rand McNally and Company, 1969.

"Procedures for instructional design: Proceedings of the 1972 Lincoln leadership conference on instructional design". Audiovisual Instruction, October, 1972, pp. 8-15.

PROVUS, Malcolm. Discrepancy Evaluation. McCutchan Publishing Co., 1971.

PROVUS, M. "Evaluation as public policy". In J. Weiss (ed.), Curriculum Theory Network, The Ontario Institute for Studies in Education, 1972.

Readings in Life Skills. Information Canada, Prince Albert, Saskatchewan, 1973.

REEVES, B.F. The First Year of Sesame Street: The Formative Research. Final Report. Vol. II of V volumes. ERIC Doc. # ED 047822, 1970.

The RFD Project: A Summary Report of the Development, Field Testing and Evaluation of a Multi-Media Program in Continuing Education for Adults. The University of Wisconsin System, 1972.

RIPPEY, Robert M. "Can evaluation be integral to innovation?". In Joel Weiss (ed.), Curriculum Evaluation: Potentiality and Reality, Curriculum Theory Network Monograph Supplement. Ontario Institute for Studies in Education, 1972, pp. 45-58.

ROBERTS, Karlene. Understanding Research: Some Thoughts on Evaluating Completed Educational Projects. Berkeley: University of California, 1969.

ROMISZOWSKI, A.J. "A systems approach to course design and evaluation". Educational Broadcasting International, 1973, (March), pp. 5-9.

SABROSKY, Laurel. "Evaluation". In H.C. Saunders et al, The Cooperative Extension Service, Prentice-Hall, Inc., 1966, pp. 339-51.

SCHULBERG, H., Sheldon, A. and Baker, F. (eds)., Program Evaluation in the Health Fields. Behavioral Publications, 1969.

SCHULBERG, Herbert C., and Frank Baker. "Program Evaluation models and the implementation of research findings". In Herbert C. Schulberg, Alan Sheldon, and Frank Baker (eds.), *Program Evaluation in the Health Fields*, Behavioral Publications, Inc., 1969, pp. 562-72.

SCHUTZ, R.E. "The nature of educational development". *Journal of Research and Development in Education*, 1970, *3*, (Winter).

SCRIVEN, Michael S. "The methodology of evaluation". In Ralph W. Tyler, Robert Gagne, and Michael Scriven (eds.), *Perspectives of Curriculum Evaluation*, AERA Monograph Series on Curriculum Evaluation, No. 1, Rand McNally and Company, 1967.

SEIBERT, W.F. *Purdue Instructional Television Scale: A Brief Description of Construction Techniques and Scoring Procedures*, Purdue University, December, 1957.

SIEGEL, S. *Non-parametric Statistics for the Behavioral Sciences*, McGraw-Hill, 1956.

SMITH, A.D., and Ingroville, R. *A Plan for Adult Information Development*, Saskatchewan NewStart, Inc., Prince Albert, Saskatchewan, 1972.

STAKE, Robert E. "The countenance of educational evaluation". *Teachers College Record*, 1967, *68*, pp. 523-40.

STAKE, R.E. "Objectives, priorities and other judgment data". *Review of Educational Research*, 1970, *40*, (April), pp. 181-212.

STAKE, R.E. and Terry Denny. "Needed concepts and techniques for utilizing more fully the potential of evaluation". In Ralph W. Tyler (ed.), *Educational Evaluation: New Roles and New Means*, The University of Chicago Press, 1970, pp. 370-90.

State University of Nebraska. *Post Secondary Education Through Telecommunications: Project Report FY 1973*. University of Nebraska. Lincoln, Nebraska, May 1, 1973.

STEELE, S.M. "Program evaluation--a broader definition". *Journal of Extension*, 1970a, *8*, (Summer), pp. 5-17.

STEELE, S.M. *Determining the Quality, Importance and Suitability of Programs*. Madison, Wisconsin: University of Wisconsin, Department of Agricultural and Extension Education, 1970b.

STEELE, S.M. *Cost-Benefit Analysis and the Adult Educator*. Washington, D.C.: ERIC Clearinghouse on Adult Education and Adult Education Association of the U.S.A., 1971.

STEELE, S.M. *Programmer's Responsibility in Examining Program Effectiveness*. Evaluation Series. University of Wisconsin-Extension, Division of Program and Staff Development, October, 1972a.

STEELE, S.M. *Six Dimensions of Program Effectiveness.* University of Wisconsin-Extension, Division of Program and Staff Development, 1972b.

STEELE, S.M. *Exploring Participants Views of Programs.* Material prepared for students in a course on Evaluation in Extension. University of Wisconsin-Madison, Spring, 1972c.

STEELE, S.M. *Contemporary Approaches to Program Evaluation and Their Implications for Evaluation Programs for Disadvantaged Adults.* ERIC Clearinghouse on Adult Education and the Division of Program and Staff Development, University of Wisconsin-Extension, March, 1973.

STOWE, Richard A. "Research and the systems approach as methodologies for education". *AV and Communications Review*, 1973, *21*, (No. 2, Summer), pp. 165-175.

STUFFLEBEAM, Daniel. *Evaluation As Enlightenment for Decision-Making.* Columbus: The Ohio State University, 1968.

STUFFLEBEAM, D.L. "The relevance of the CIPP evaluation model for educational accountability". *Journal of Research and Development In Education*, 1971, *5*, (February), pp. 19-25.

SUCHMAN, E.A. "The principles of research design". In J.T. Doby (ed.), *An Introduction to Social Research.* The Stackpole Co., 1954, pp. 253-269.

SUCHMAN, E.A. *Evaluative Research: Principles and Practice in Public Service and Social Action Programs.* Russell Sage Foundation, 1967.

TABA, Hilda and Enoch Sawin. "A proposed model of evaluation". *Educational Leadership*, 1962, *20*, (October), pp. 57-59ff.

TAYLOR, Peter A., and Thomas O. McGuire. "A theoretical evaluation model". *Manitoba Journal of Educational Research*, 1966, *1*, pp. 12-17.

TOPPER, L. "Evaluating audio-visual material". *Educational Technology*, May, 1973, pp. 19-20.

TOSTI, D.T. and J.R. Ball. *A Behavioral Approach to Instructional Design and Media Selection.* Albuquerque, New Mexico: Westinghouse Learning Corporation, 1969.

TRIPODI, Tony, Phillip Fellin, and Irwin Epstein. *Social Program Evaluation.* F.E. Peacock Publishers, Inc., 1971.

TYLER, Ralph W. *Basic Principles of Curriculum and Instruction.* University of Chicago Press, 1950.

UDVARI, Stephen S. "Applying research innovations and ideas: A description of the rural family development educational delivery system". In Chester Klevins (ed.), *Materials and Methods in Adult Education*, Klevins Publications, 1972.

UHL, Norman P. Identifying Institutional Goals. National Laboratory for Higher Education, 1971.

VAN GIGCH, John P. and Richard E. Hill. Using Systems Analysis to Implement Cost Effectiveness and Program Budgeting in Education. Educational Technology Publications, 1971.

WARNER, W. Keith. "Problems in measuring the goal attainment of voluntary organizations". Journal of Adult Education, 1967, 19, (No. 1).

WARREN, P.W. The Role of Research in Research and Development Projects. Saskatchewan NewStart Corporation, 1969.

WARREN, P.W., L.A. Lamrock and R. Himsl. Interim Report of Evaluation System and Procedures. Saskatchewan NewStart Inc., February 5, 1971.

WEBB, E.J., D.T. Campbell, R.D. Schwartz and L. Sechrest. Unobtrusive Measures: Nonreactive Research in the Social Sciences. Rand McNally and Company, 1966.

WEDEMEYER, Charles A. "Evaluation of continuing education programs". American Journal of Pharmaceutical Education, 33, (No. 5), pp. 793-863.

WEISS, Carol H. Evaluation Research. Prentice-Hall, Inc., 1972.

WHOLEY, Joseph, et al. Federal Evaluation Policy: Social Evaluation by Federal Agencies. The Urban Institute, 1970.

WILEY, D.E. "Design and analysis of evaluation studies". In M.C. Wittrock and D.E. Wiley (eds.). The Evaluation of Instruction. Holt, Rinehart and Winston, 1970, pp. 259-269.

WILHELMS, Fred T., ed. Evaluation As Feedback and Guide. Association For Supervision and Curriculum Development, NEA, 1967.

WITTROCK, M., and D. Wiley. Evaluation of Instruction: Issues and Problems. Holt, Rinehart and Winston, 1967.

YOUNG, Stanley. "Organization as a total system". In Lesley H. Browder, Jr. (ed.), Emerging Patterns of Administrative Accountability, McCutchan Publishing Corporation, 1971, pp. 311-30.